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ABSTRACT

Educational facilities analyzed in this bulletin are in the countries of the Republic of Afghanistan, Australia, Bangladesh, India, Japan, Republic of Korea, Malaysia, Nepal, New Zealand, Pakistan, Singapore, Sri Lanka, and Thailand. The first section reviews the historical reasons for different stages of school building development in the countries, and discusses current organizational structures for planning and constructing new buildings. The second section contains data on educational buildings and facilities including floor plans, photographs, and building measurements of two or more specific schools in each country. Other data are summarized on enrollment, number and type of schools, retention by grade, average space allotments, organizational structure, and geographic and climatological factors. The third section describes a number of different building programs in the countries. The fourth section contains an annotated bibliography of more than 100 entries relevant to educational building in the Asian region that has been published in recent years. (MLF)

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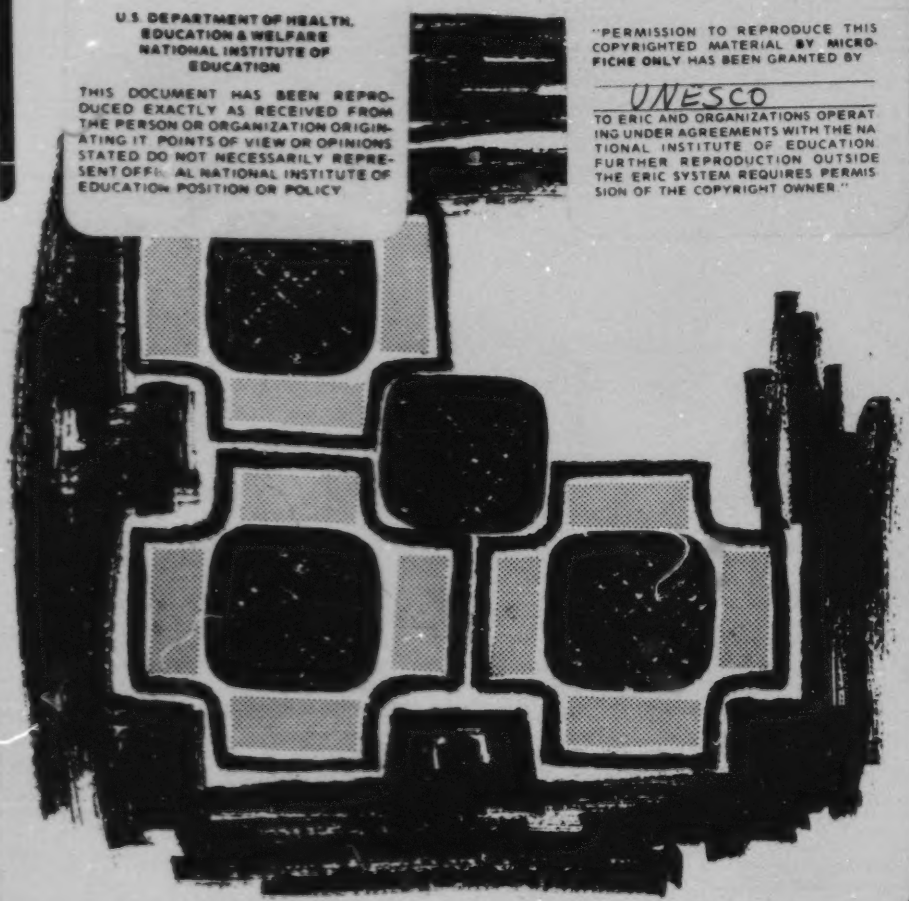

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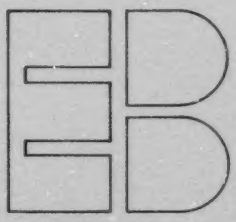

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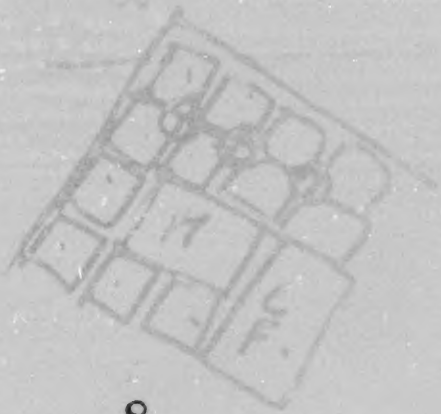
LIST OF ABBREVIATIONS

The following arbitrary abbreviations are some that have been used in the preparation of Sections Two and Three. The meanings are as printed alongside each.

admin.	– administration	lib.	– library
asst. prinpl.	– assistant principal	offi.	– office
a.v.r.	– audio-visual room	phys. lab.	– physics laboratory
chem. lab.	– chemistry laboratory	pri.	– principal
c.p.i.	– Central Planning Institute	prinpl.	– principal
		s.	– store
c.r.	– classroom	sc.	– science room
ext.	– extension	soc. sci.	– social science room
G	– men's toilet	schl. blg.	– school building
home econ.	– home economics room	staff res.	– staff residence
indust. art	– industrial arts room	st.	– store
lab.	– laboratory	tech. blg.	– technical building
L	– ladies' toilet	tut	– tutorial rooms
lec. r.	– lecture room	w.c.	– water closet (toilet room)

SECTION ONE

REVIEW OF EDUCATIONAL BUILDING AND FACILITIES IN THE ASIAN REGION



REVIEW OF EDUCATIONAL BUILDING AND FACILITIES IN THE ASIAN REGION

Background

> *In olden times the scholars (Shih) taught in their own hamlets and villages. Morning and evening they sat by the gateway. The rooms at the side of the gateway were called Shu—the term which came to be commonly used for a private or family school.*
>
> *Ma Jung, 1st century A.D.*[1]

The different stages of school building development in the countries of the Asian region owe much to the chequered history of Asia itself. The distribution of schools in each country, the characteristics of design and construction and the management of building programmes are a reflection, not only of the availability of natural and human resources in the various parts of the region, but also of political events, for those countries that—at some time or other in the past—fell to the colonial powers, show a somewhat different development of school building from those that were able to remain independent.

In a recorded history of education that has no parallel in any other part of the world, there is scant reference to school buildings, for much of Asia has a benevolent climate which enabled the single teachers and their students to work outdoors or under a lightweight shelter. As a result, where simple schools were built, they were sufficiently temporary to have long-since disappeared. One architectural inheritance from the past, nevertheless, might be said to be that of the open-hall schools in Sri Lanka, derived from the preaching hall[2] which is still a feature of Buddhist temples in Burma, Sri Lanka, Thailand and the countries of the former Indo-China peninsula.

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1. H.S. Galt. *A history of Chinese educational institutions.* Vol. 1. London, Probsthuin.

2. Ceylon. Ministry of Education and Cultural Affairs. *Education in Ceylon: a centenary volume,* by P. Senarat. Colombo, 1969. Chapter 61.

It is however necessary to turn to more recent history for an understanding of the present situation and of possible future developments. While the indigenous education systems had grown according to the natural genius of the peoples of the countries of the region, the advent to Asia of the colonial powers slowly resulted in change, especially in education at the second level. A now-familiar pattern began to emerge. Urban secondary schools were first built for the elite. Later, there were moves to introduce education in the urban and rural areas for the common people. Although the construction of some schools was financed from central government funds, the ordinary people were, by and large, expected and encouraged to build their own schools.[3] By the middle of the 19th century, the scale of the problem posed by the attempts to develop formal education systems was becoming evident. If education was to be brought to every village and hamlet, far greater resources than the colonial powers were willing to set aside would be needed. (Some idea of the scale of the problem is given by the results of an early survey of indigenous education in the Indian state of Madras where more than 14,000 village primary schools were recorded).[4] Thus there continued a situation in which the educational effort was concentrated in the towns where those who passed successfully through the system could be engaged as clerks and other functionaries, while all but a few rural areas remained substantially without extensive formal educational services.

The urban school buildings of the 18th and 19th centuries in the colonized areas of Asia were modelled on designs familiar to the colonizers. The separate classroom for each teaching group that became common in Europe in the 19th century was introduced, while the general form of the urban schools mirrored, as appropriate, the English grammar school, the French lycée or the Dutch high school. The results were usually incongruous for, in Europe at the time, architecture was undergoing a stage of 'period' revival with some buildings designed in a classical style, derived from the periods of ancient Greece and Rome through that of the Renaissance as well as *directly* from measurements of classical ruins, and others designed in the Gothic style derived from mediaeval religious buildings. The conflict, known as the battle of the styles, found full reflection in Asia. Although there are a number of outstanding schools in the Gothic

3. For a thoroughgoing history of the development of formal schooling in one country, see: H. Kroeskamp, *Early school masters in a developing country: a history of experiments in school education in 19th century Indonesia*, Assen, Van Gorcum, 1974.

4. Syed Nurullah and J.P. Naik. *History of education in India during the British period.* Bombay, Macmillan, 1951.

style, particularly those built by the missionary teaching orders, the classicists really won the day. Buildings such as Royal College, a large secondary school in Colombo,were styled in what might be called 'public works Georgian', and one of the Indian schools illustrated in Section Two of this Bulletin provides a good example of a more severe classical treatment. The Greek temple, after all, had external verandahs and these were to be preferred in the tropics to the internal aisles of the Gothic church. Of course, buildings such as Royal College, Colombo, were very costly indeed and, in consequence, not many of them were constructed. However, as they were intended only for the elite, they were found adequate until well into the 20th century.

In late 18th-century Japan, when compulsory primary education was introduced by the primary school order of April 1886 and many schools had to be built, a nationwide dispute arose over the relative merits of Japanese and European styles of school building. In the beginning, extreme positions were taken and purely Japanese or purely European styles of building resulted. By the end of the century, however, a new type of building emerged which not only suited the climate of Japan but was also a compromise between the two styles.

The introduction of public education in the various countries of the region forced governments to assume some responsibility for building. In Afghanistan, Japan and Thailand, three of the countries that have always remained independent, this responsibility was assumed by the respective education authority and, in all of these countries today, there are sizable school building sections in the education ministries.

The colonial pattern was different, however. All public building was the responsibility of a separate department of public works whose employees would design, from time to time, a whole range of buildings such as courts, army barracks, hospitals, police stations, government offices and—schools. The public works employee at the professional level was almost invariably a civil engineer although, in a few cases, architects were engaged to design the most prestigious buildings. In the 19th century, the main concern might have been to design buildings that were structurally sound and, if they were important enough, to provide them with a facade that met the current criteria as to style—either classical or Gothic. The interior of the building seems to have been dealt-with in an arbitrary way; in schools, comprising a simple division into classrooms.

Slowly the practice grew up of requesting the public works department for a school of a stated number of classrooms and, by the 20th century, it had evidently become common to assess the national stock of

educational facilities in terms of quantities of classrooms and to express the deficiencies in the same way. It was very evidently not the business of the designing engineer to enquire what took place in the classroom or in the school as a whole, or to enquire whether or not the accommodation provided was found convenient. Neither, it seems, was it the practice of the educators to communicate their satisfaction or dissatisfaction with the accommodation to the engineers. Obviously when there was such an acute shortage of schools, anything that the public works department was able to provide was readily acceptable.

This is not to suggest that the schools of the past were hopelessly bad. They were often in fact very satisfactory, for the designers had themselves been to school, were intelligent people, and in most cases did what they could to provide the best buildings possible. In addition, the needs for accommodation other than classrooms hardly existed in the last century when curricula included only academic subjects. The buildings required were thus very simple compared with those of today in which facilities for a wide range of activities are required. The point to be made, however, is that a practice developed in which there was very little communication, if any, between those who designed the schools and those who used them—a practice which has unfortunately been followed until the very recent past in many countries.

This rather comfortable non-relationship between educators and engineers was disturbed only when by occasional failure to assign the right priorities to educational buildings in the overall programmes for the construction of public works, the school building programme fell behind. Ominously, this was becoming an increasingly frequent occurrence, as is well illustrated by the Special Report of the Director of Public Instruction for Ceylon, made in 1869, in which he recommended, ". . . The erection of new buildings and the repairing of schools in the country should be done through the medium of the Government Agents instead of the Public Works Department". The problem was, at root, a result of the spread of education from the towns, where large and expensive buildings could be easily constructed and supervised, to the rural areas where not only were there great numbers of schools to be built, but these had usually to be located in remote areas where supervision was expensive.

But the difficulties of school building in mid-19th-century Ceylon foreshadowed a far more dramatic situation that was to develop. Independence for the countries of the region brought with it a determination to, among other things, provide education for all. This resulted in a need to construct a huge number of schools throughout the region—in every village

and hamlet and in all quarters of every town; in the mountains and the valleys and on the plains and the deltas. Large sums of money were set aside for school construction programmes which many public works departments were ill equipped to handle. Programmes of the scale involved should have resulted in intensive studies of the design requirements, building and building component standardization, prefabrication and bulk purchasing and new methods of contract management. These studies were not made—owing to lack of competent personnel and the pressures of time.

Saddled with building codes and building and administrative regulations that often date from the last century, staffed only with civil engineers and a handful of architects and faced with continuing responsibility for all public building programmes, many of which were also on a far larger scale than before independence, the departments of public works in many countries proved quite incapable of providing the hundreds of thousands of classrooms now required. By 1960, when the representatives of the countries of the region met at Karachi to discuss ways of increasing the rate of introduction of universal primary education, the shortage of school buildings, together with the shortage of teachers and the need to plan more effectively, ranked high on their list of priorities for future action.

The post-independence era was marked by several other changes, however, which were soon to bring about an improvement in the situation. One significant development that was to have a far-reaching effect on the capacity of the public works departments to design schools was the establishment of schools of architecture in many countries of the region. At the turn of the century, Japan had been probably the only Asian country offering the training of architects. In India, before independence, there developed a school of art at Bombay in which architectural education formed part of the course of studies, while in Indonesia, the Institute of Technology at Bandung provided elements of architectural education in its courses for civil engineers. For most countries, however, the education of an architect involved provision for study in Europe, Australia or America. By the 1970s the picture had changed completely. Apart from an increase in the number of schools of architecture in Japan, there were 14 schools in India, and schools had been established in Burma, Bangladesh, Indonesia, Iran, Republic of Korea, Malaysia, Pakistan, the Philippines, Singapore, Sri Lanka and Thailand.

The result of this development has been a change in the organization of the public works departments and of the ministries of education that undertake their own building, with responsibility for the design of buildings—including schools—now assigned to architects. Meanwhile, the still

more numerous civil engineers, formerly jacks-of-all-trades, are now able to practice their special skills which are in ensuring the structural strength of buildings through the design of foundations, and reinforced concrete or steel frames.

The design of a building obviously involves a clear understanding of the activities that it is to house. Educational building design is no exception to this truism and, in recent times, there has been an increasing recognition that it is not enough to have architects as designers in the departments of public works, but that the architects should be specialists in the field of school building design. In Malaysia and Indonesia, for example, the supply of trained architects has been sufficient to permit such specialization and with remarkable results. On the other hand, it may be years in a country as large as India before such specialization can be contemplated for, although there are 14 schools of architecture, there are still fewer than 4,000 qualified architects.

A major gap in the professional skills available in the countries of the region is in the field of building costing and this, it seems, is likely to be filled slowly. In the countries where the resources are most limited and thus need to be used with the greatest care, there is almost a total lack of building cost control and cost planning due to a shortage of building cost specialists. The few institutions in the region providing training in this important field are to be found mainly in India, Malaysia, Singapore, Hong Kong and Sri Lanka. Building costs, it is true, form a small section of the curriculum for civil engineers but their work is largely concerned with estimating for structures, dams and irrigation ducts, rather than school buildings. In most countries, building costing thus remains something that is 'picked up' by building technicians who in time and with experience become estimators whose function is to work out the cost of what has already been designed, rather than to advise the designer before he begins on how much money can be spent on the building, and on its constituent elements in relation to the available resources.

A further change that has done much to bring about an improvement in both the quality and the quantity of the schools that are now being built in the region has been the establishment in a number of countries of school building research organizations. Perhaps the oldest and best known of these is the School Building Division of the Central Building Research Institute at Roorkee in India. Formed in the mid-1960s, the division has a good staff of architects, engineers and building cost specialists and is able also to draw on the expertise of more than 200 other building scientists in the Institute. These include specialists in building materials of all types, building physicists, mechanical specialists and specialists in construction

management. Thailand and Sri Lanka have school building research specialists within their Education Ministry school building units and a research unit is being established in the office of the President of Construction of the Ministry of Education, Afghanistan. In Indonesia, school building research is continued in a separate establishment especially created for the purpose and linked to the national Regional Housing Centre with which it can share library and documentation facilities. In Bangladesh, a limited amount of work is currently in progress in the Engineering University, which has a contract with the Government for the design of new primary schools.

In the Asian region as in others, Unesco has sponsored school building research since 1962 and continues with a fairly steady programme of studies, often prepared on contract. The topics of these are carefully selected as being of likely application either to the region as a whole or to substantial sub-regional groups of countries. As will be evident from the bibliography forming Section Four of this Bulletin, which provides abstracts of virtually all of the major published material on school buildings in the region, much remains to be done. It is now possible, nevertheless, to observe the beginnings of great changes in the field of educational building in Asia. There is an increased awareness of the fact that school buildings are for education and that this means that the architect must be apprised of the educational activity he has to house. There is an increase in the number of designers who are specializing in school building design and also an increase in the research activities that are necessary if change is to be brought about. Not only is there research into the design process itself, but also into equally important and connected fields such as the improvement of construction methods and management. And, finally, the rate at which schools are being built is now, although still far from adequate, a remarkable improvement on that situation of which the Director of Public Instruction complained so subtly in his Special Report to the Government of Ceylon in 1869.

Relationships between schooling and school buildings

Although there are still countries in Asia in which the backlog of construction is formidable, it is possible at this stage for national authorities to start to take stock of their schools to begin to evaluate what is being built and, perhaps more important, to consider what must be built for the future. One of the lessons to be learned from countries having large stocks of old buildings is that schools, from time to time, need to meet the changing requirements of education. If the old buildings were designed and constructed in such a way that the need for change was not

foreseen, the ultimate cost of change can be very high indeed. Countries that are only now establishing a new stock of schools for the first time are thus in a somewhat fortunate position, for they can employ much of the hard-earned experience of others in the design of the new buildings.

Two useful concepts have been developed in the context of design for change; first, that of *adaptability*, which has been defined as low-frequency, high-magnitude change and, second, that of *flexibility*, which is the converse.[5] For example, a change that required brick walls to be demolished and rebuilt in another position inside the school would require the building design to have the quality of adaptability, for such changes would be needed only at infrequent intervals. On the other hand, activities that needed partitions to be moved *daily* or *weekly* would require a building design of which the inherent quality is flexibility.

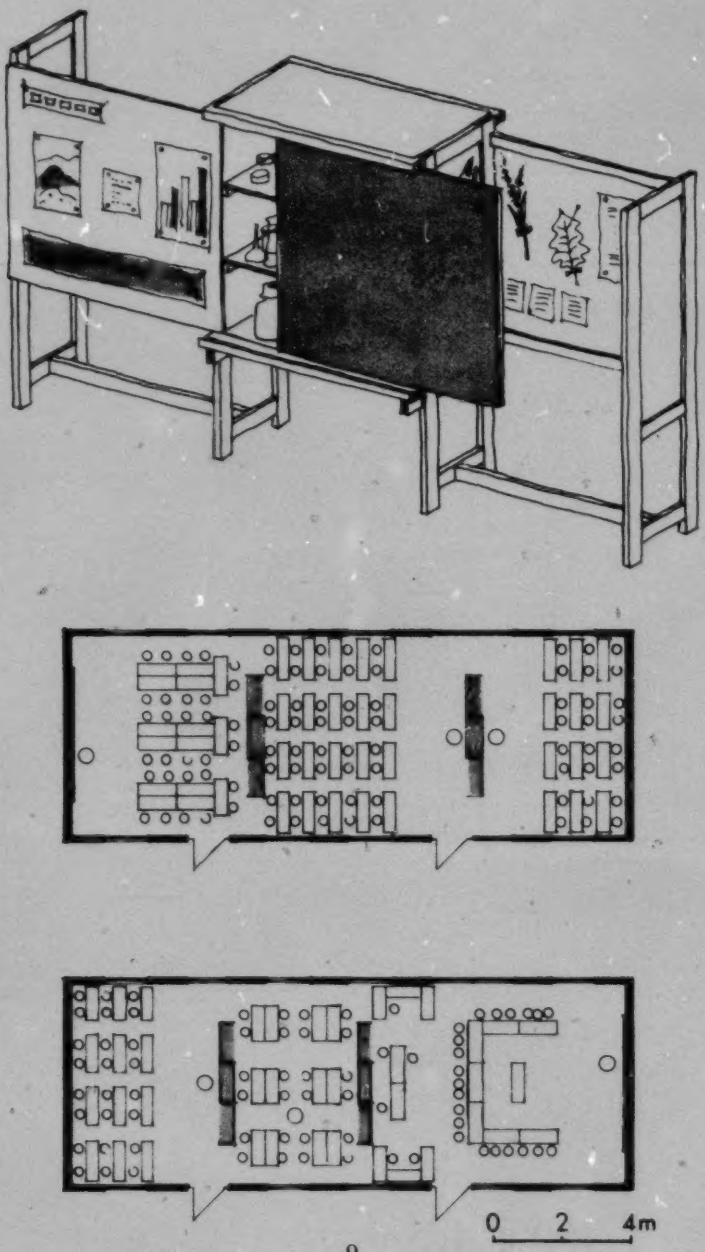
Excellent examples of both adaptability and flexibility in school building design are provided by schools in some of the countries of the Asian region. The oldest of these examples are, again, the open-hall schools of Burma and Sri Lanka, where both adaptability and flexibility are potential qualities of which, from time to time, advantage has been taken in the construction of temporary divisions to provide science teaching and other spaces. The provision of an open-hall is in itself, however, not to be regarded as a solution to the problem posed by the need for change unless advantage is actually taken of its great potential. It is necessary to be able to divide large spaces for different sorts of activity, and failure in the past to make provision for such division has, to a large extent, been responsible for bringing the open-hall schools into disfavour with the teachers who have to work in them. One way of resolving the difficulty is that adopted recently in Laos and in the Maldives Republic, where the open-hall concept has been retained but specific provision made for sub-division by functional division units which can be moved at will. These schools are truly flexible in character. (see Figure 1)

Adaptability is far more difficult to achieve, for it involves the design of the building structure itself. The case of the schools of Uttar Pradesh, one of the northern States of India, exemplifies the dilemma of the designer in this context.[6] Built for an area in which timber is scarce and thus, when compared with other building materials, expensive, the Uttar

5. OECD. *Providing for future change, adaptability and flexibility in school building.* Paris, 1976.

6. Unesco Regional Office for Education in Asia. *Innovation in management of primary school construction—a case study*, by R.D. Srivastava. Bangkok, 1974. (Educational Building Report No. 3)

Figure 1. *Movable division unit and sketches showing flexibility in optional placement for varied school functions.*



Pradesh primary schools were to be constructed of brick, cement and steel. The original prototype design was for a two-classroom unit in which a large space was divided in half by means of a free-standing brick partition which extended up to within about 60 cm of the underside of the concrete roof and its supporting light-weight steel trusses. The building as designed was essentially adaptable in character, for the brick dividing partition could easily be knocked down and re-erected elsewhere if needed. This was possible because the partition did not touch and therefore did not support the roof. (see Figure 2) As the programme for construction

Figure 2. *Photo of a prototype according to the original design for primary schools of Uttar Pradesh. Note that adaptability was planned, as the partition was non-supporting: the trusses gave all interior support.*

of 2,000 of these schools progressed, however, the normal rises in the prices of building materials meant that savings had to be made in the costs of what was already one of the cheapest primary school designs in the Asian region. In the end, the only way in which money could be saved was found to be by slightly raising the height of the brick partition so that it supported the roof. The saving was of one light-weight steel truss in each building. The small alteration in design had, however, the effect of changing the character of the school fundamentally, for the building was *no longer adaptable.* (see Figure 3)

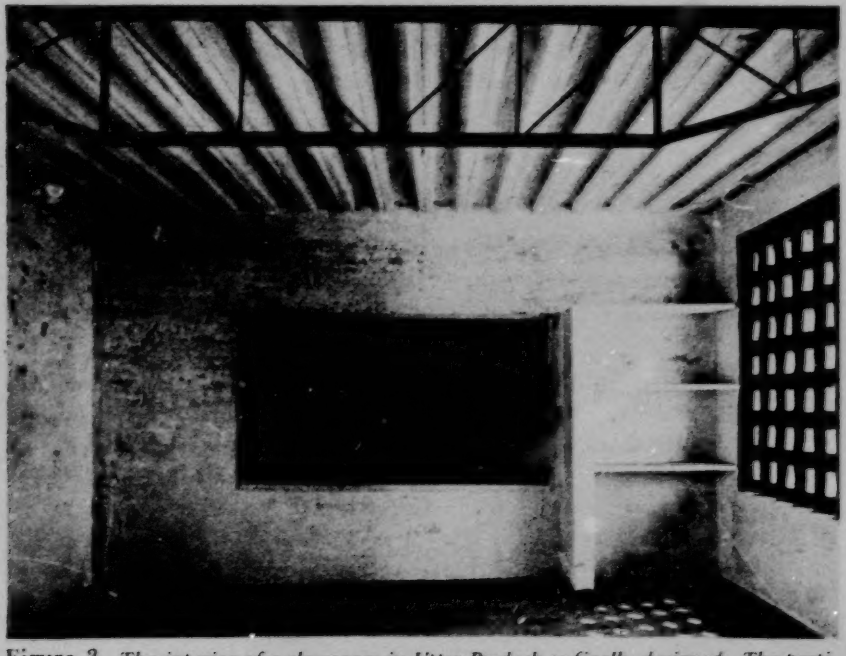


Figure 3. *The interior of a classroom in Uttar Pradesh as finally designed. The partition was made load-bearing, thereby saving one truss per building—but sacrificing adaptability.*

Afghanistan provides another example of a country where the adaptability of primary school buildings has been recognized as of importance. Like most other countries in the region, Afghanistan faces the problem of retention of pupils in primary schools. While vigorous efforts are being made to improve retention rates, it has been recognized that the problem is likely to be amenable only to a long-term solution. There is thus no need to build 40-place classrooms for each of the six grades in the primary school for it is quite clear that it will be some years yet before 100 per cent retention is achieved.

Schools have thus been designed for the situation as it is projected some 10 years hence and the areas of the classrooms adjusted accordingly—with the rooms diminishing in size for the higher grades. The designers have also taken note, however, of the fact that the situation will eventually change, and the internal partitions have been designed to be non-load-bearing and therefore easy to knock down and rebuild in new positions as dictated by probable improvement in the retention ratios.

Both the Indian and Afghanistan examples cited here serve not only to illustrate the concept of adaptability in building design but also another concept that is increasingly gaining acceptance among countries with heavy investment in school construction. This concept suggests that it is wise to spend money only on the needs of the present, while allowing for the unforeseen or partly foreseen needs of the future.

Paradoxically, this dictum on expenditure is not in conflict with either the adaptability or the flexibility concepts discussed above. As long as building design for adaptability and flexibility costs no more than design which lacks these qualities then, in principle, the designer should design for change. As soon as the cost of adaptability exceeds that of non-adaptability, however, the designer is investing money in the unforeseen and this, according to the second concept mentioned above, is regarded as unwise.

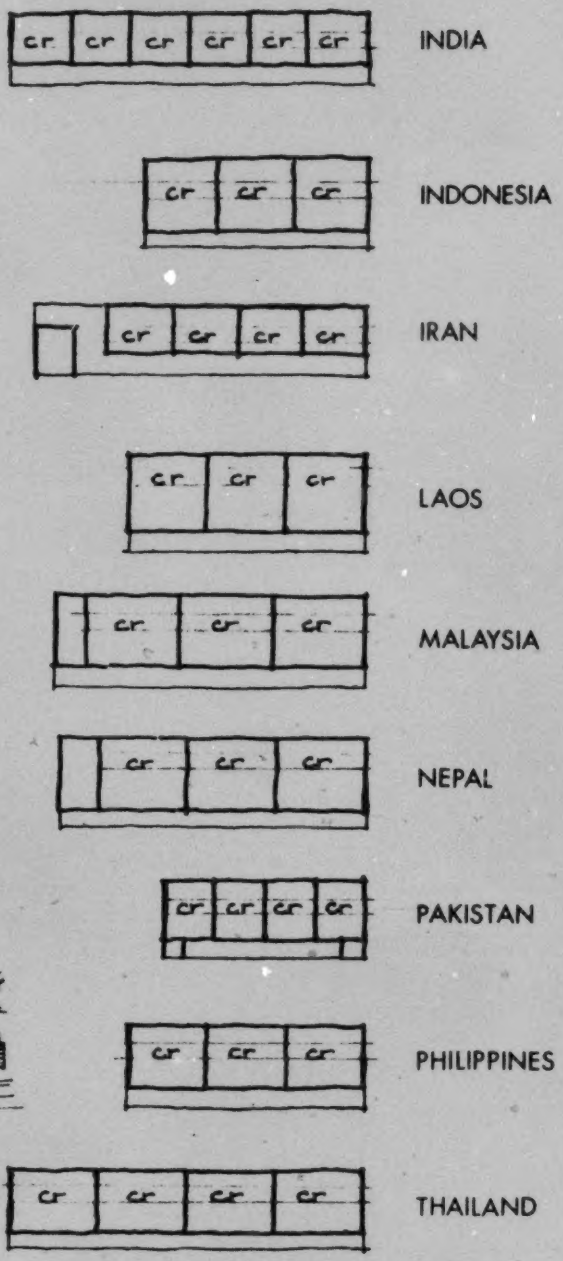
Thus, in the Indian example, when the cost of adaptability was greater than that of providing a less adaptable building, the designer sacrificed the adaptability. In the case of Afghanistan, the Government quite correctly decided not to invest money in classrooms which were so large that they could not conceivably be fully utilized for many years to come. This appears to be a very sensible use of limited resources and one that might attract much more attention than it has, for while the problem of drop-out (low retention rates) in the education systems of the countries of the Asian region is a matter of major concern, money continues to be invested needlessly on buildings which are designed as if the drop-out phenomena did not exist, usually with rows of classrooms all the same size, although the highest class may only have to hold a fraction of the number of pupils of the lowest. (see Figure 4)

The need for designers to question and to understand the uses to which the schools they design are to be put has never been greater, for Asian education is now at a stage in its development where many significant changes planned in the recent past are in the course of implementation and changes of a much more wide-ranging nature are on the horizon.

Current changes are many and diverse. In Sri Lanka, for example, the introduction of a substantial proportion of work-oriented education

Figure 4.

These free sketches (not to scale) represent the plan views of primary schools, usually rural, that have been built in the countries listed. The existence of classrooms comprising a row of cells in uniform size in a single building would suggest that the number of children in each space is the same. This, particularly in rural areas, would rarely be so. Architectural solutions can easily be found to avoid the waste of money resulting from building space that is not required.



into the curriculum has resulted in the need for a much wider range of accommodation than was previously the case. (see Figure 5). The needs have been met by the Education-Ministry-based School Works unit which has provided a variety of new building designs for the new activities. In Pakistan, the introduction of agro-technical education calls for new sorts of accommodation for home science, metalwork, woodwork, electricity and agriculture and the Federal as well as the Provincial Governments have produced prototype designs for the buildings needed. (see Figure 6)

Figure 5. *Plan views of workshop and laboratory buildings adapted from plans of schools in Sri Lanka.*

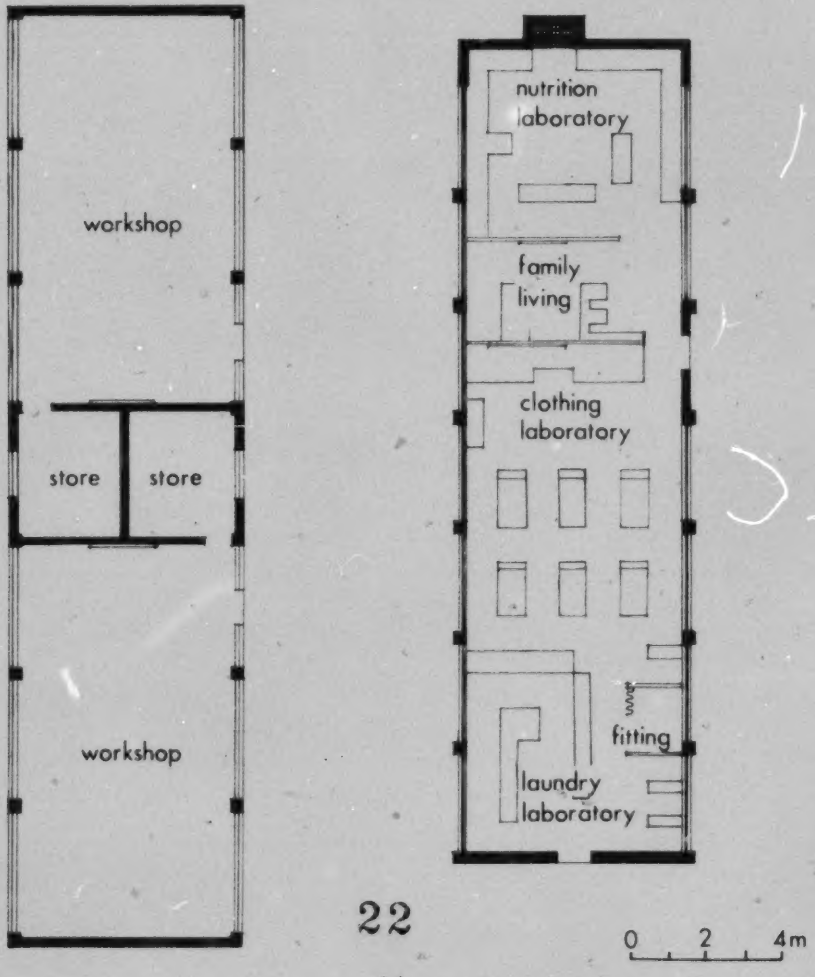
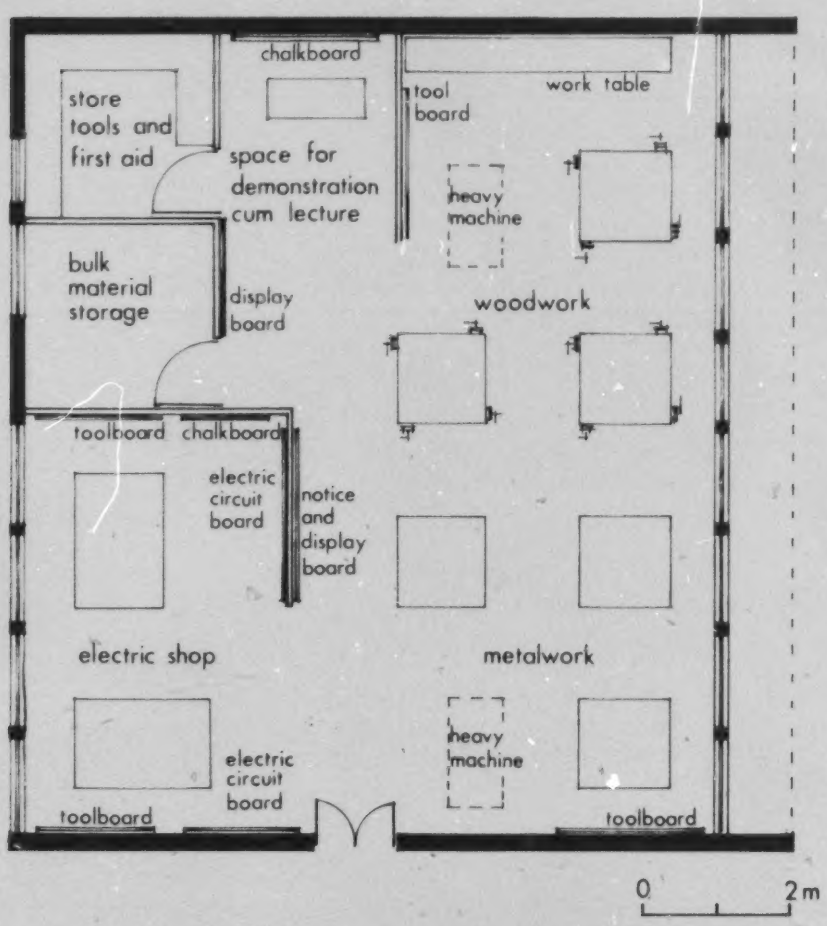


Figure 6. *Design for a Pakistan school workshop with space and equipment for varied technical practice.*



Afghanistan too is introducing technical education, but in the secondary schools, some of which will be converted to secondary technical schools. The capital cost of this programme will clearly depend on the extent to which the old secondary school designs prove to be adaptable.

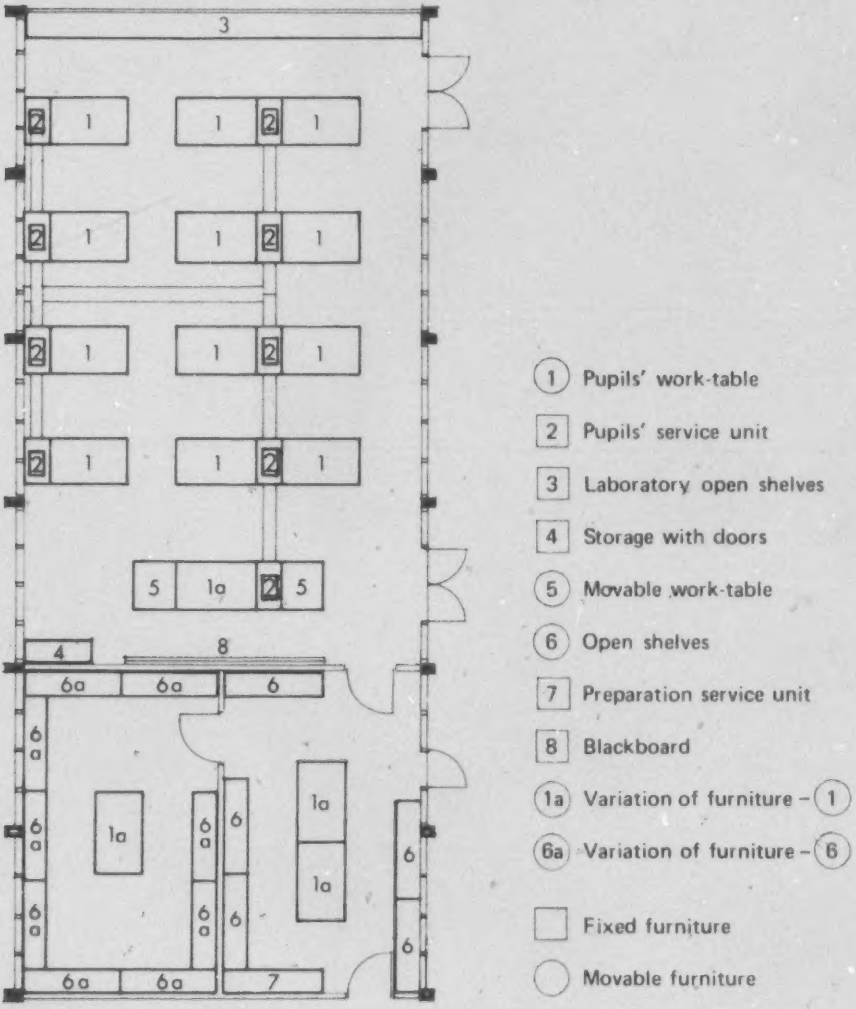
Apart from these examples of major change, most countries of the region are engaged in an almost continuous process of adjusting and adapting their curricula and methods of teaching in the different subject areas. Science is one such area that continues to receive considerable attention.

Often this work has few if any implications for the building designer. Occasionally, however, developments having significant implications for building occur. The work on the new science curricula which is currently in progress in Thailand suggests that a classroom with a sink and movable desks may provide as good accommodation for the early learning of science as a formal laboratory. If this is so, then the capital cost of education at the level at which the new curriculum is being introduced can obviously be reduced. The introduction, a few years ago, of integrated science provides another example of the need for designers to keep closely in touch with educational change, for the laboratories needed for teaching the subject had unique qualities. (see Figure 7) In Pakistan, centrally located, rural primary schools are being used to provide in-service training facilities for rural primary school teachers and are also serving as resource centres to which teachers in the locality can make permanent reference and thus raise the quality of their offerings. The modification of existing schools and the design of new schools to house these functions provides an interesting study in design.

While the current changes in education in Asia result in the creation of a number of fascinating design problems for architects, however, the future offers a fundamentally different and challenging prospect. Many governments are concerned with the large portions of their populations who, despite the governments' best efforts, have had no good access to education. Those who had no schools to attend; those who dropped out of school for reasons over which they had little or no control; those who received education that was so little related to their lives as to be all but useless to them—these people are a focus of thought on educational development in the Asian region today.

Many tentative solutions to these problems have already been found, some of which have implications for design. The idea widely discussed in India, of entry to school at an age convenient to the student and the student's family in relation to the family's social and economic situation, has attracted considerable attention and would result in school buildings occupied no longer entirely by young primary school children, but by children and adolescents of varying ages. The grouping of this new school population within and without the building on the school site would require, perhaps, the redivision or adaptation of existing buildings in new ways, and give rise to fresh thinking on the design of new schools. In this, the architect can be the ally of the teacher, for many of the new educational ideas will be difficult enough to introduce without an additional constraint provided by inappropriate buildings.

Figure 7. *Design for a laboratory for integrated science teaching in Malaysia.*



While the formal system of education will most likely continue for years to come to provide the mainstream of educational opportunity in most countries of the region, ways in which increasing numbers of adolescents and adults are to be provided with educational opportunity are on the increase. Community education, community schools, adult literacy

classes—these are already terms in common use. Some of the activities foreseen can obviously be undertaken in conventional school buildings, many of which are grossly under-utilized. Other buildings are unsuitable in their present form, however, to house adult activities.

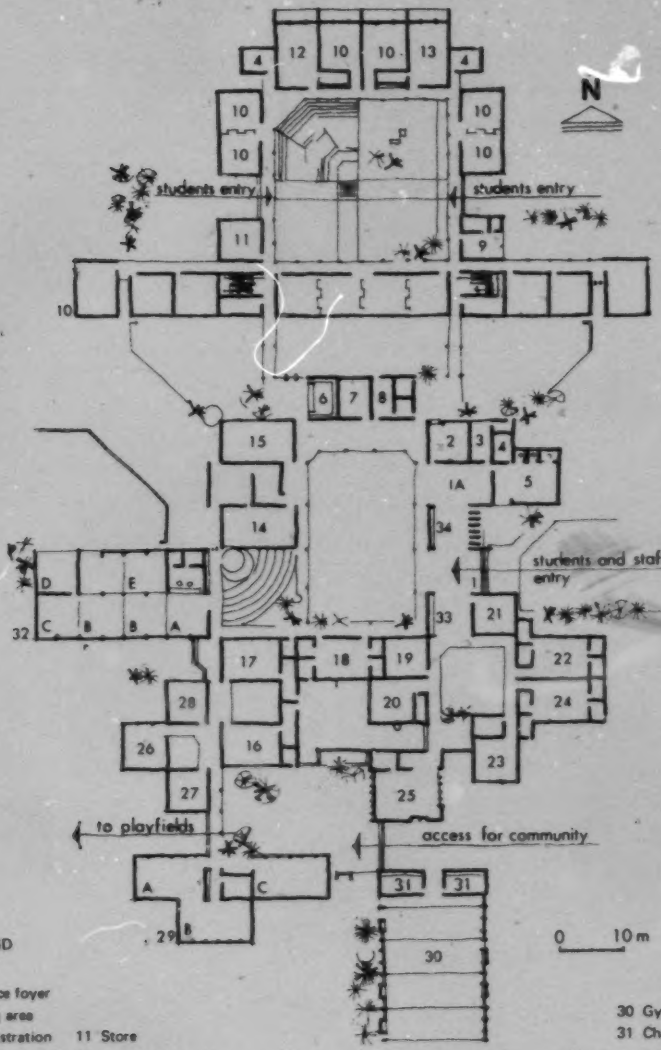
The response to the problem in the short term has been, in some countries, to build or to consider building special schools for community activities. Designs for schools and centres to house community educational activities have been produced in India, (see Figure 8) while Thailand has an extensive range of physical facilities for the community in parallel with the existing schools. In the long term, it is evident that such solutions will require far more resources than are ever likely to be available and the search has thus started for unused and under-utilized resources that can be used for education.[7] Insofar as the search is related to physical facilities (and this is neither its single nor major purpose), the existing schools will receive major attention, for it is usually only in the urban areas that their utilization is greater than 50 per cent of the working day. Certainly, in the rural areas of Asia where the opportunities for education have always been least, there is, in terms of physical facilities, a vast, untapped resource. As rural schools are not always the most suitable places for adolescent and adult learning, there is a challenge to the designer to develop economical ways of adapting existing buildings to the new needs and of designing new schools for both formal and community education.

The critical problem that is faced in most countries of the region today is the absence of a well-designed mechanism by which the educational needs of the future can be communicated to building designers. The best evidence in support of this statement is provided by what can be described as the 'uniformity paradox', by which, despite the diversity of cultures, climates, building materials and very different types and stages of educational development in the countries of the region, the image of school buildings is one of relative uniformity—a uniformity which is pervasive in both urban and rural situations and in almost all countries, whether or not at some time or other in their histories, they fell to the colonial powers. (refer to Figure 4 on page 13)

This uniformity may be attributed to a variety of circumstances. First, until recent times, 'practical' subjects formed no part of the curricula; there was thus a continued and universal acceptance of the classroom as the base for education. The Karachi Plan recommendations on the needs of Asia in primary education, mentioned above, referred to the

7. Unesco. Asian Programme of Educational Innovation for Development. *Methodological design for the study of unused and under-utilized potentialities; report of a preparatory group meeting, Bangkok, 9-14 June 1975.* Bangkok, 1975.

Figure 8. *Plan for a comprehensive school also offering adult community education—designed by the Central Building Research Institute of India.*



LEGEND

1 Entrance foyer
1A Waiting area
2 Administration
3 Principal
4 Toilets
5 Staff room
6 Book store
7 Medical unit
8 Girls' rest room
9 Vice Principal
10 Classrooms
11 Store
12 Geography room
13 Maths room
14 Home science lab.
15 Group activity room
16 Art and craft
17 Music room
18 Biology practical
19 Biology theory
20 General science room
21 Chemistry theory
22 Chemistry practical
23 Physics theory
24 Physics practical
25 Science museum
26 Teachers training
27 NCC/ACC/students union
28 Adult education
29 Workshops for :
A Middle classes
B Secondary classes
C Girls
30 Gymnasium
31 Changing rooms
32 Library :
A General reading
B Stacks
C Reference
D Seminars
E Class reading space
33 Lockers
34 Notice board

extreme importance of providing hundreds of thousands of *classrooms* during the next ten years.[8] Although general secondary education in most countries has included science as a subject in the curriculum for several decades, and most secondary schools have science laboratories, by 1969, only ten of the countries of the region had specific provision for prevocational or practical work in their curricula and—as this included agriculture—the impact on the physical form of schools was not great. The classroom dominated then, as now.

Second, the shortage of school building designers, until quite recent times, resulted in the need to use standard designs for schools, for the quantity of buildings to be constructed has been far too great for individual designs to be produced for each new building needed. Within each country this has led to considerable uniformity, well reflected in a comment attributed to the Prime Minister of Singapore to the effect, ". . . that in the last 10 to 15 years, the mass production of schools and teachers by the Government has produced teachers as anonymous, faceless and listless as the institutions which now house them . . ."[9] An editorial in the Journal that printed the comment[10] explained that "the standardization of the design of schools has contributed to this dilemma."

While collaboration between the Education and Public Works Departments of Singapore has undergone a remarkable improvement since 1967 when the Prime Minister's remarks were made, his observation in respect of the standard appearance of schools remains applicable not only to the countries, but pervasively to the region where the output of architects from the colleges and universities has been low in the face of the tens of thousands of schools for which designs were needed.

The changes to education that are in progress and are foreseen for the future in Asia are such that the old ways of requesting buildings from the design service, whether it be in the Public Works Department or in the Education Ministry itself, are patently no longer adequate. The communication between educational administrators and architects, when it is established, will have to be 'two-way', with the educators becoming as informed of the possible ways in which architecture can serve their needs as the architects become informed of the educational requirements. The trend to specialization in school building design in some of the countries of the

8. Unesco. *The needs of Asia in primary education; a plan for the provision of compulsory primary education in the region.* Paris, 1961 (Educational Studies and Documents No. 41)

9. *Journal of the Singapore Institute of Architects, no. 8.* January 1967.

10. *Ibid, no. 12.* May 1967.

region has to be matched from the educational side. The possibility of introducing a course unit in teacher training colleges which might be taught by a teacher educator/architect team and dealing with the use of school buildings and their sites might be a very sound training innovation. Certainly, in rural areas, the teacher will often have a part to play in the siting and, where the community itself undertakes the building, in the design of schools. Good ideas on design possibilities to make the buildings more useful for teaching and learning would not come amiss in such situations. Likewise, the design of a simple primary school by students as part of their five-year course in architecture might lead to similar improvements in understanding. For the urban teacher, the programming of activities in a large school in itself presents considerable problems to which some formal education might provide solutions.

The organigrammes shown in the country presentations in Section 2 of this Bulletin are the most significant evidence indicating a lacuna in the architect-educator relationship. No country reports a unit or organization, inter-disciplinary in character and concerned with development work on school building design. Significantly also, none of the institutions concerned with school building research in the region has educators as staff members. These institutions may, at heart, and despite their occasional contacts with teachers, be thought perhaps to continue to be more concerned with building form than with function?

Much, in this context, is still to be learned from the work of the United Kingdom School Building Development Group. Established in the early 1950s to control the costs of schools while at the same time ensuring the provision of minimum standards of amenity, this interdisciplinary group of educators, architects and cost specialists not only achieved its original purpose of developing a mechanism for controlling the costs of schools, but also brought about a revolution in the design of schools to meet the new ideas on teaching that were and still are developing in the country. Never comprising more than a very small number of specialists, the costs of which were minute in relation to the capital expenditure on buildings, the group and its work inspired the creation of similar groups in other countries but unfortunately, never in Asia (except in India) where the need for such activities is perhaps the greatest.

Building the buildings

Planning has always been easier than implementation (easier said than done) and this is especially true of rural school building. Once land is available, urban buildings rarely present major building problems. Rural school building programmes, on the other hand, are fraught with

difficulties—after the acquisition of land, there are building contracts, skilled building labour, materials supply, supervision and finance. Significantly, three of the articles by individuals in this Bulletin report on experiences in the management of large-scale, rural school construction.

With some 80 per cent of the population of the region living in the rural areas and, as we have seen, with the neglect of rural education until almost the middle of the present century, there is a very large back-log of school construction to be made up. In days gone by, it was common for rural schools to be built by rural communities but, with the onset of independence in many countries of the region, governments, anxious to hasten the introduction of universal education, assumed the responsibility for the construction of schools. With hindsight, it can be said that this was, in many cases, an unwise decision in relation to the human and material resources available and, as a result, construction programmes began to fall behind.

Two alternative solutions to the problem are now being tried. First, there is a return to the idea, albeit in modified form, of the communities' assuming more responsibility for the construction of their own schools. Second, building systems involving the use of prefabricated structural components are being developed with the non-structural components of the system being provided in part or in whole from local resources.

One of the early successful attempts to re-involve the community in construction was that made in the 1960s in the Philippines, where the 'Army type' precut timber school was distributed to the rural areas—often remote islands—and constructed by the local people, guided by a very useful handbook which showed how the components were to be assembled. Later models of similar design were produced in steel, and the current design that is being shipped to communities is in reinforced concrete, able to withstand cyclonic winds. It is planned to supply 4,000 of these new schools every year for the next 10 years, by which time most communities in the Philippines will have constructed their own schools. (refer to pages 165-172)

In India, a somewhat different approach was taken. The concept of prefabrication was accepted in principle but it was decided that, if the prefabrication process could take place in the rural areas, not only new schools, but new skills would be introduced. The construction of 2,000 schools in rural Uttar Pradesh in a period of two years has largely bourne out these ideas and has demonstrated that, with appropriate management, it is possible to construct schools in an economical way using modern building techniques in a rural setting. Management is indeed the key to

rural school programmes of any magnitude and this has been perhaps nowhere so well demonstrated as in Indonesia where three-classroom primary school buildings are being built under community auspices at the rate of 10,000 schools per year. The buildings themselves are of conventional design and built completely of locally available materials. What is new are the financial arrangements made by the central government, the pre-planning of the local commitment to build, and the supervision of the entire operation from the centre through the local authorities. This includes a system of reporting that enables the government to assess the rate of progress of building on each site and thus enables it to take remedial action in the event of the programme falling behind schedule. (see Figure 9 and pages 147-164) Similar programmes on a smaller scale have been planned and/or implemented in Afghanistan and Laos.

The Government of Bangladesh has been able to study both the Indian and the Indonesian experience at the planning levels and at the sites where some of the schools have been built. As a result, the Bangladesh University of Engineering and Technology has been commissioned to produce a building design which can be used for the large-scale building programmes planned for the rural areas of the country and in which community participation is to be assumed. This spread of ideas is, apart from its intrinsic value, a good indication of the growing importance now being attached to the main problem in the provision of schools in rural Asia; namely, how can large-scale programmes of construction be realized?

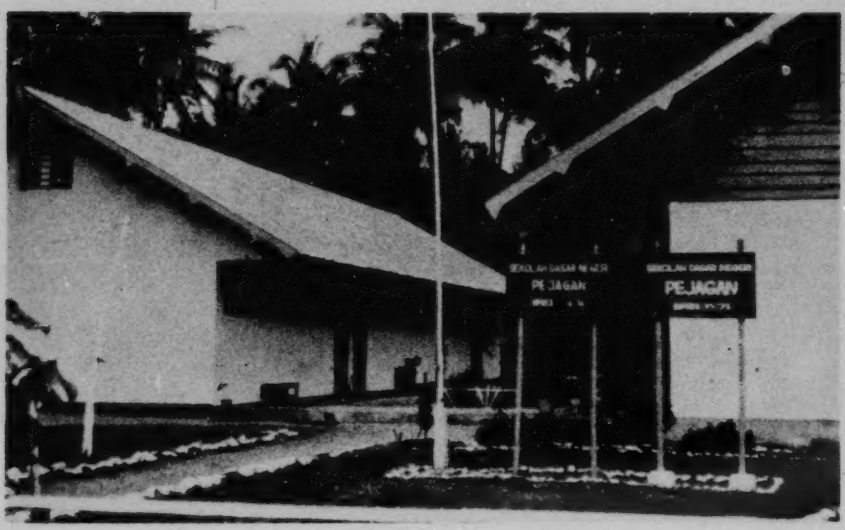


Figure 9. *New 'INPRES' school in Indonesia.*

A look to the future

The task that lies ahead for the countries in the region is one of extremes. At one end of the scale there are those countries in which, despite great efforts, fewer than 30 per cent of those eligible for primary school are enrolled and, at the other end, there are those countries where statistics show that enrolments in the primary schools are declining slightly—Japan even has a very slight decline in enrolments at the second level. All Asian countries except Japan, however, report substantial increases in the numbers enrolled in the first and second levels together and thus it does not appear that there will be any reduction soon in the rate of increased demand for school buildings nor in capital investment. On the contrary, with the diversification of education at the lower and higher secondary stages accompanied by the apparent need for more costly, specialized teaching spaces and equipment, the ever-growing awareness that all schools should have adequate sanitary facilities, and the inevitable escalation in costs, the capital investment sector will continue to grow at an extremely and probably increasing rate.

The magnitude of the task that confronts the countries of the region can be seen from Table I. An average annual total capital expenditure for all levels of education for all buildings, land and facilities in the region is around 4,500 million dollars. It might be said that if all Asian children aged 5-14 were enrolled in school by 1990, the cost of providing modest classroom accommodation alone would exceed 10,000 million U.S. dollars at present-day prices, and to provide reasonable school facilities might cost from three to four times as much. With some countries reaching the limit of their financial capabilities it seems destined that a sizable proportion of children in the region will not only *not* have school facilities, they will not have access to education at all.

Looking at the situation today, Table II (page 26) shows that, for some countries, the increase in capital expenditure has far outstripped the increase in enrolments. The question that perhaps appears uppermost is what proportion of the total expenditure on education *should* be spent in capital investment. Table III (page 27) gives the ratio of capital expenditure to the total expenditure on education and the educational development in terms of enrolment for some countries of the region. The relative expenditures cannot be compared directly with one another, since it cannot be assumed that the build-up of capital expenditure is the same in all cases, but the table does show that some countries are spending a great deal more than others to achieve the same objectives.

Table I. Progress in primary and general secondary school enrolment, the region[1], 1960-1975, with projections for population 5-14 years

Year	Population 5-14 years	Average growth rate	Primary enrolment	Average growth rate	General secondary enrolment	Average growth rate	Primary and secondary enrolment	Crude enrolment ratios (Primary and Secondary)
1960	220 282 983		82 712 749		25 666 099		108 378 848	49.20
		2.97		5.76		6.51		
1965	254 935 277		109 422 810		35 178 416		144 601 226	56.72
		2.96		2.70		4.64		
1970	294 900 991		125 017 576		44 142 491		169 160 067	57.36
		2.34		2.65		3.16		
1975	331 069 691*		138 815 339*		51 567 231*		190 382 570*	57.51
		2.26						
1980	370 224 743							
		2.50						
1985	418 842 966							
		2.34						
1990	470 179 656							

1. Not including the People's Republic of China, the People's Republic of North Korea, Democratic Republic of Viet-Nam, or the Union of Soviet Socialist Republics.

* 1974

Table II. Increase in total enrolment (all levels), total public expenditure on education and total capital expenditure (Index 1960 – 100)

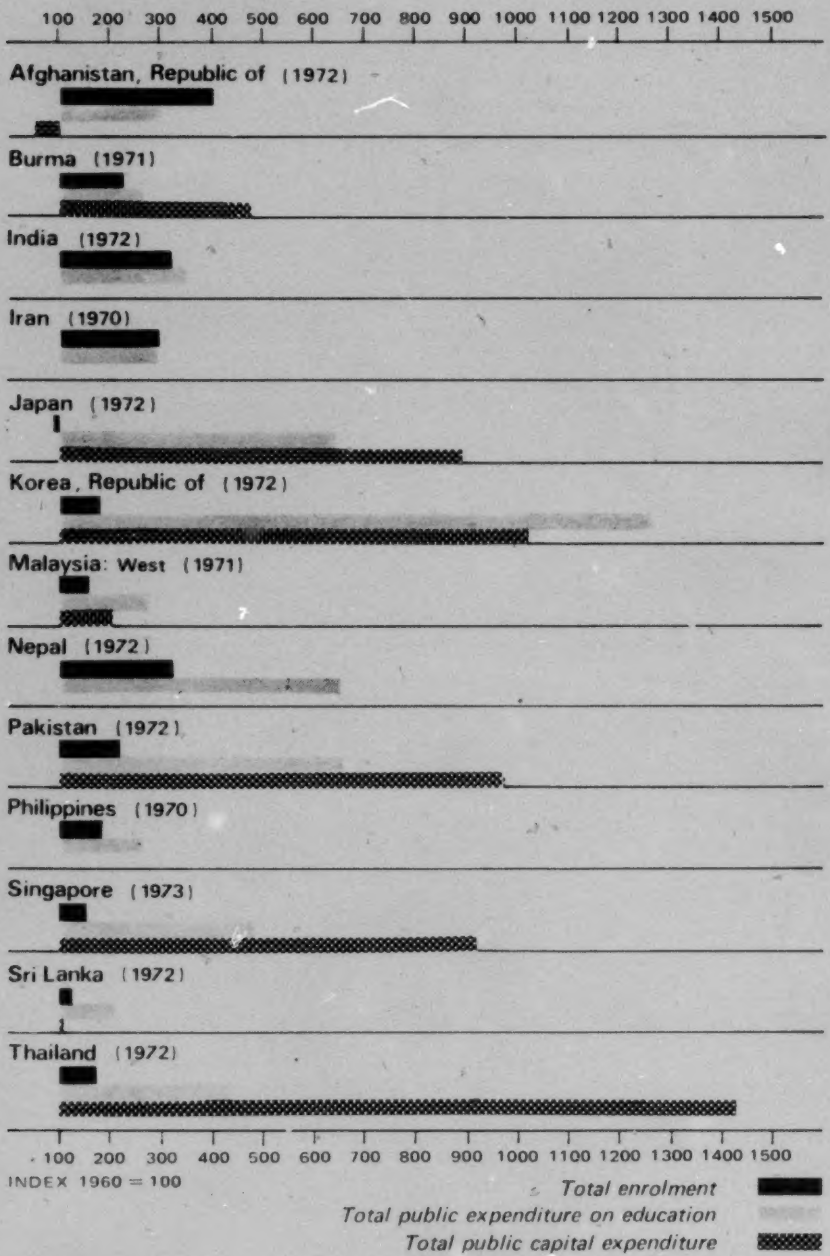

100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
Afghanistan, Republic of (1972)
Burma (1971)
India (1972)
Iran (1970)
Japan (1972)
Korea, Republic of (1972)
Malaysia: West (1971)
Nepal (1972)
Pakistan (1972)
Philippines (1970)
Singapore (1973)
Sri Lanka (1972)
Thailand (1972)
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500
INDEX 1960 = 100
Total enrolment
Total public expenditure on education
Total public capital expenditure

Table III. Public capital expenditure on education

Country	Year	Capital expenditure as % of		Gross enrolment ratio		
		Total educational budget	Total public expenditure	Year	1st level	2nd level
Afghanistan	1972	5.9	-	1972	22	7
Burma	1971	5.4	1.09	1973	85	33
India	1968	7.4	1.48	1970	84	24
Indonesia	1971	39.5	7.46	1971	69	8
Iran	1972	14.5	0.77	1972	79	32
Japan	1972	28.9	5.71	1972	99	100
Korea, Rep. of	1972	14.4	3.45	1972	104	49
Malaysia West	1971	8.6	0.93	1972	96	25
Mongolia	1970	7.1	-	1970	109	49
Nepal	1971	51.4	4.3	1970	25	9
Pakistan	1972	27.7	1.36	1971	50	18
Philippines	1968	-	-	1970	109	49
Singapore	1973	12.46	0.43	1973	101	51
Sri Lanka	1972	5.3	0.66	1971	99	47
Thailand	1972	25.9	5.10	1972	85	21
Australia	1972	18.1	2.75	1972	104	68
New Zealand	1971	18.6	1.00	1972	104	67
U.S.A.	1971	11.6	2.15	1972	125	96
U.S.S.R	1972	15.3	1.88	1972	103	67

Source : Unesco Regional Office for Education in Asia, Bangkok. *Progress of education in the Asian region; second statistical supplement.* Bangkok, 1975. 155 p.

Part of the answer to this higher capital expenditure on the part of some of the countries may lie in the high cost of school building; an analysis of the per-place areas and per-place costs by country tends to bear this out. (see Table IV, page 29) The primary and secondary schools of Australia, New Zealand and Japan all have a very high cost per place, whereas the schools of the Republic of Korea, Malaysia and Singapore occupy a middle position.

This is a cursory analysis, and some of the costs would have risen considerably since the given date. Thus the theory does not fully explain the wide variation in either per-place areas or per-place costs—nor does it explain how Singapore can provide 17.27 m^2 per place in its secondary schools for a comparatively low figure of $429 as against Japan, which provides 14.85 m^2 per place at a cost of $1,810—nor why the Republic of Korea and Malaysia can make-do with a relatively low area per place in their secondary schools.

The question might be asked as to which of the per-place areas and costs shown in Table IV might be accepted as a norm. With such a range, no ready answer to this question appears: each country must decide. It will depend upon the needs of its educational system, the availability of finances and. of course, the local costs of materials and labour. It may clearly be seen, however, that *the school buildings of the future must be simple functional buildings, capable of adaptation to meet the changes that are bound to develop in education,* and must provide a minimum of space at relatively low cost. It is no measure of sophistication in design or technology to provide more space at higher cost than is necessary. Rather, it is the converse.

Many of the countries report in Section Two that space norms exist, but it will be observed that these relate to particular rooms. So far as is known, no country lays down minimum areas per place or maximum cost-per-place standards for the school as a whole, although this is fundamental to overall control over costs. It may be argued that in a developing situation it is difficult to establish standard costs per place, but even in such a situation there are techniques for making adjustments to the standard cost. Certainly the *concept* of minimum areas per place can be applied in all circumstances. Methodologies have been developed whereby the needs in terms of space to meet the requirements of the curriculum can be estimated—it is thereby possible to regulate the allocation of teaching and ancillary spaces for differing sizes of enrolment.

The other aspect related to cost is that of design. Reference has been made to the dearth of skilled designers and the need for the designer to

Table IV. Analysis of per-place areas and per-place costs of schools as recorded in Section II of this Bulletin

Country	First Level				Second Level			
	Year	Area per place m^2	Cost per place US$	% Teaching space to total area	Year	Area per place m^2	Cost per place US$	% Teaching space to total area
Afghanistan	1975	1.42	48.23	87.8	1974	1.85	80.36	62.4
Australia	1974	2.94	939.47	58.8	1971	9.12	1 053.50	49.7
Bangladesh	1969	1.01	7.94	80.0	1967	4.96	109.53	48.7
India								
- Tamil Nadu	1953	1.09	6.07	66.5	1954	1.59	12.30	70.8
- Uttar Pradesh	1960	1.28	8.13	71.3	1943	2.43	24	77.6
Japan	1970	8.05	829.59	61.5	1973	14.85	1 809.71	68.3
Korea, Rep. of	1975	1.31	46.25	55.1	1974	2.84	44.82	59.3
Malaysia	-	-	-	-	1968	4.30	87.60	61.9
Nepal	1969	0.58	20.95	84.5	1952	1.46	16.77	66.5
New Zealand	1973	3.46	974.58	62.7	1973	10.67	2 370.09	63.1
Pakistan	1975	0.85	69.52	73.6	1970	5.50	355.55	42.89
Singapore	1975	7.87	177.32	54.7	1975	17.27	428.79	41.5
Sri Lanka	1976	1.57	78.95	69.4	1940	5.33	287.79	68.5
Thailand	1964	3.27	136.24	53.0	1964	3.55	144.60	47.0

understand the needs of the educator—as well as the problems of construction, particularly in the rural areas where most of the future construction is likely to take place. These are no idle phrases and, until this understanding really begins to percolate through to the design sections, the *status quo* will stand and the cost of school construction will remain at its present high level. If building costs are to be truly low enough for countries to build all of the new school places required and if local capabilities are to be brought into play, then what is now thought to be a proper school building will have to be reconsidered, the traditional concepts of design and construction must be critically examined and we must learn to make economical use of the available resources.

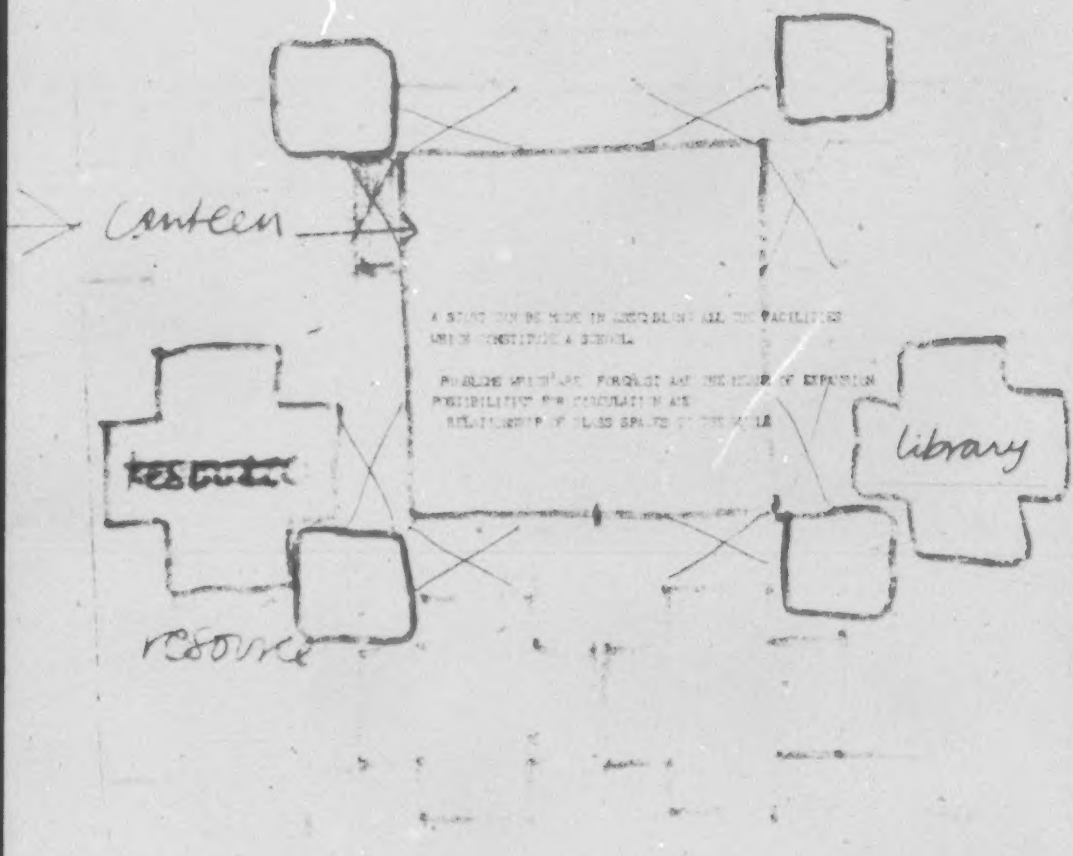
Equally important is the question of supervision, particularly in the rural areas, where access to sites is difficult, where the sites are widespread and where the money available for expenditure at each site is small. Here the normal government rules and procedures cannot be applied in the same manner as for urban construction. Where any innovation is proposed to be introduced, the need for adequate supervision and guidance is paramount, for if the work is well and carefully done and no defects become apparent, the innovation may then be widely accepted, resulting in good, functional buildings for the ever-increasing numbers of children who depend upon us for a place in which to go to school.

Figure 10. *A large primary school classroom in the Philippines.*

LEARNING / TEACHING

SECTION TWO

EDUCATIONAL BUILDING AND FACILITIES IN ASIAN COUNTRIES



Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

THE REPUBLIC OF AFGHANISTAN

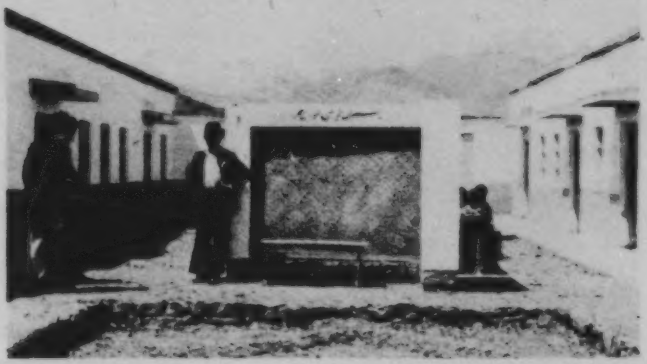
Afghanistan is a land-locked country about 673,109 square kilometres in area and having a population of at least 19 million persons. The climate and topography have a fundamental effect on the design of educational buildings. In the capital, Kabul, for example, the temperature not uncommonly has a range of more than 55°C, from a minimum of −20°C in winter, to 35°C in summer. In the southwestern desert areas, the range is often more than 60°C with a summer maximum of just under 50°C.

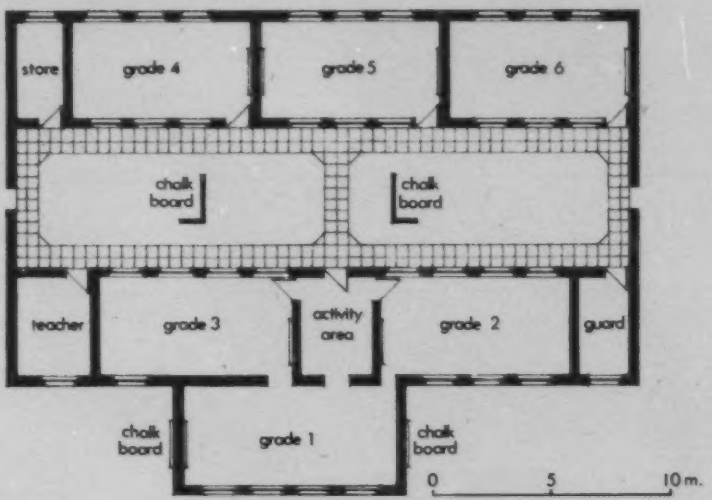
From northeast to southwest, Afghanistan is divided by mountain ranges including the Hindu Kush and the Pamirs, with elevations of up to 7,600 metres. The scanty precipitation that occurs is thus often in the form of heavy snow which makes building impossible in the winter and in some areas reduces the school year to a little over six months. In such a mountainous country, people tend to live in the valleys and both agriculture and settlements are lineal along the rivers, with the uplands sometimes used for grazing by the nomadic section of the population in the summer months. Away from the main road that rings the country, access to the populated valleys is, because of the mountains, sometimes very difficult indeed and this too is a severe constraint in respect of the location of schools and the range of materials that can be used to build them. These difficulties are not mitigated by the fact that most of the country lies in an area of high seismic risk.

The education system of the country was changed by the new education policy, approved in January 1975. The main points of educational reform, in so far as they have a direct effect on educational building, include the introduction of free and compulsory primary education of eight years' duration and the provision for an increase in the number and types of vocational schools, through the conversion of some of the existing secondary general schools (lycées), as well as through the construction of new institutions.

The schools illustrated in the following pages require some explanation as they were constructed just before the current reforms were announced. The primary school was designed in the Education Ministry and provides not only inside teaching areas but also areas for teaching outside in the sun when temperatures inside are too low for comfort. The construction is earthquake-resistant. The second of the secondary schools illustrated—that in Kabul city—is of interest as the construction used is a Russian system of large prefabricated panels placed by crane.

REPUBLIC OF AFGHANISTAN **1. Rural primary school**

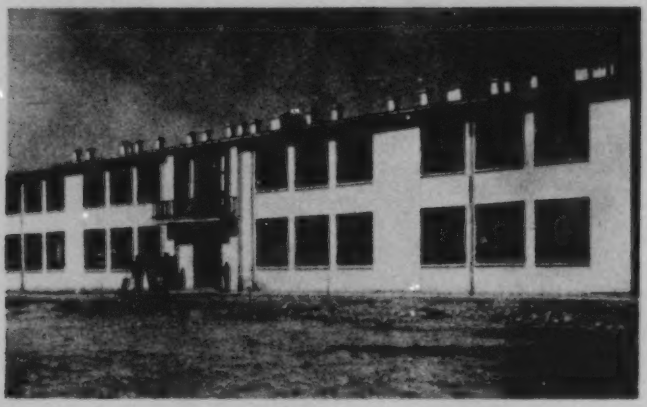


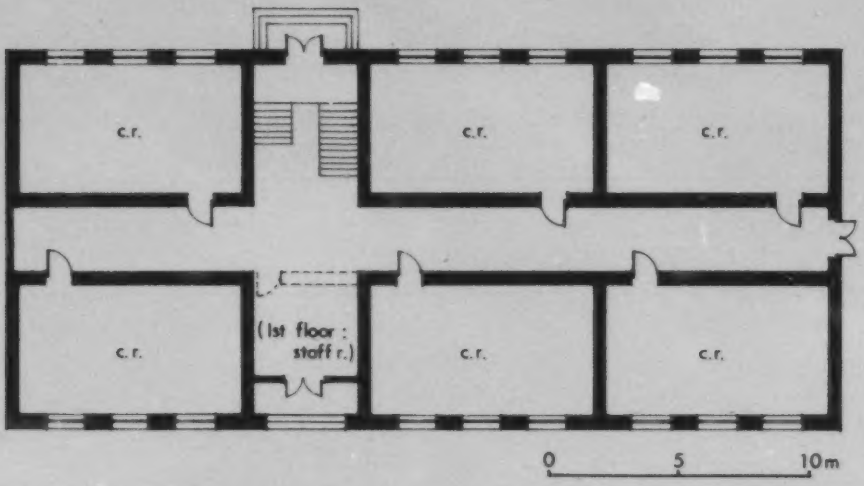


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 170	Construction completed in	1975
Nett covered area	: 241.50 m2 (100%)	Cost of land	US $ 45
Nett area teaching spaces	: 212.10 m2 (87.8%)	Cost of building	US $8,200
Area administration spaces	: 29.40 m2 (12.2%)	Building cost, per student-place	US $ 48.23
Area per student-place	: 1.42 m2		

Construction: stone foundation; concrete floor, plastered brick walls; mud roof on poplar poles with plastic damp-proof membrane.



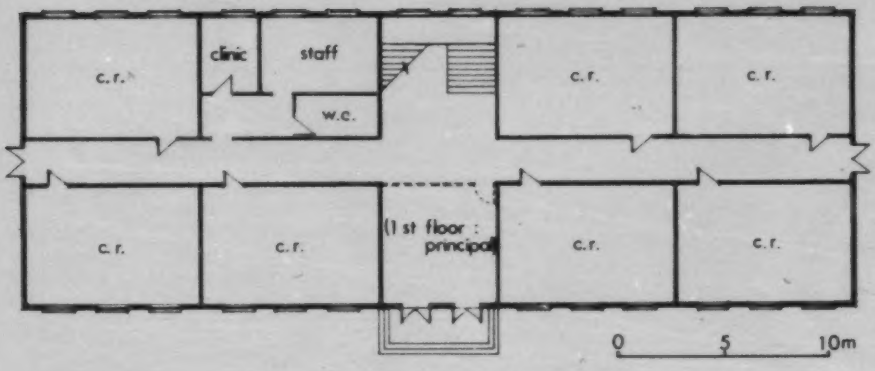


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 480	Construction completed in	1973
Nett area (all floors)	: 773 m2 (100%)	Cost of land	US $ 3,600
Nett area of teaching spaces	: 510 m2 (66%)	Cost of building	US $21,800
Nett area administration spaces	: 20 m2 (2.5%)	Cost of external work	US $ 3,260
Circulation area	: 243 m2 (31.5%)	Building cost, per student-place	US $ 45.42
Area per student-place	: 1.61 m2		

Construction: stone foundation; plastered brick walls, concrete floors; galvanized iron roof.

REPUBLIC OF AFGHANISTAN **3. Urban primary/secondary school**



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 560	Construction completed in 1974	
Nett area (all floors)	: 1036 m2 (100%)	Cost of land	US $27,000
Nett area of teaching spaces	: 646 m2 (62.35%)	Cost of building	US $45,000
Nett area administration spaces	: 107 m2 (10.33%)	Cost of external work	US $27,000
Circulation area	: 267 m2 (25.77%)		
Area of toilets	: 16.0 m2 (1.55%)	Building cost, per student-place	US $ 80.36
Area per student-place	: 1.85 m2		

Construction: prefabricated reinforced concrete large panels in walls, floors and roofs.

REPUBLIC OF AFGHANISTAN — 4. The stock of schools in 1975

Type of school	Number of schools
Primary	3 220
Secondary–lower	515
Secondary–upper	196
Total stock of institutions	3 931 schools

Number of teaching spaces in schools	Primary	Secondary
Classroom	8 358	5 336
Laboratories		147
Libraries	62	159

Number of	Primary	Secondary
Schools in permanent buildings	1 145	461
temporary buildings	709	1
rented buildings/other	1 362	240
Residential schools	4	9
Wholly boys' schools	2 817	630
Wholly girls' schools	403	81

Shortage of facilities	Classrooms	Laboratories	Arts/crafts rooms	Libraries
Primary urban	4 018		500	
rural	8 042			
Secondary urban	339	240		80
rural	652	480		160

REPUBLIC OF AFGHANISTAN

5. Enrolment in 1975

Enrolment	Primary	Lower Secondary	Upper Secondary
Boys	532 079	95 751	45 619
Girls	89 358	13 054	6 056

Enrolment by grade		Boys	Girls	Total
Grade	I	133 399	24 223	157 622
	II	102 389	18 184	120 573
	III	93 681	15 849	109 530
	IV	79 693	13 009	92 702
	V	68 080	10 199	78 279
	VI	54 842	7 894	62 736
	VII	40 059	5 919	45 978
	VIII	29 764	4 028	33 792
	IX	25 928	3 107	29 035
	X	18 652	2 527	21 179
	XI	14 652	1 948	16 600
	XII	12 315	1 581	13 896

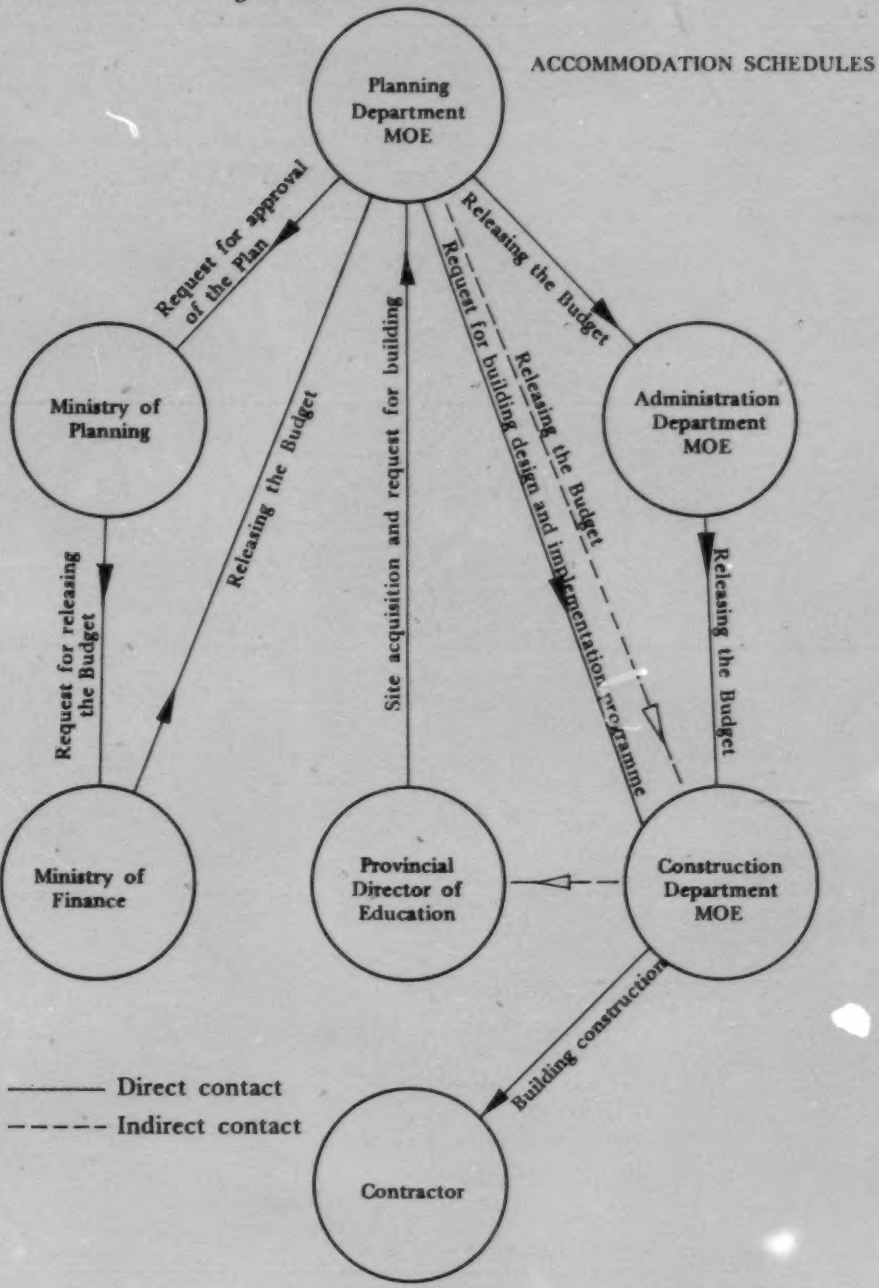
Retention by grade	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Primary	100	74	70	72	72	68						
Secondary—lower						100	76	72	76			
Secondary—upper									100	80	81	80

Average size—urban	Primary	Lower Secondary	Upper Secondary
Of teaching groups	41.75	36.43	18.19
Of schools	192.99	211.27	263.65

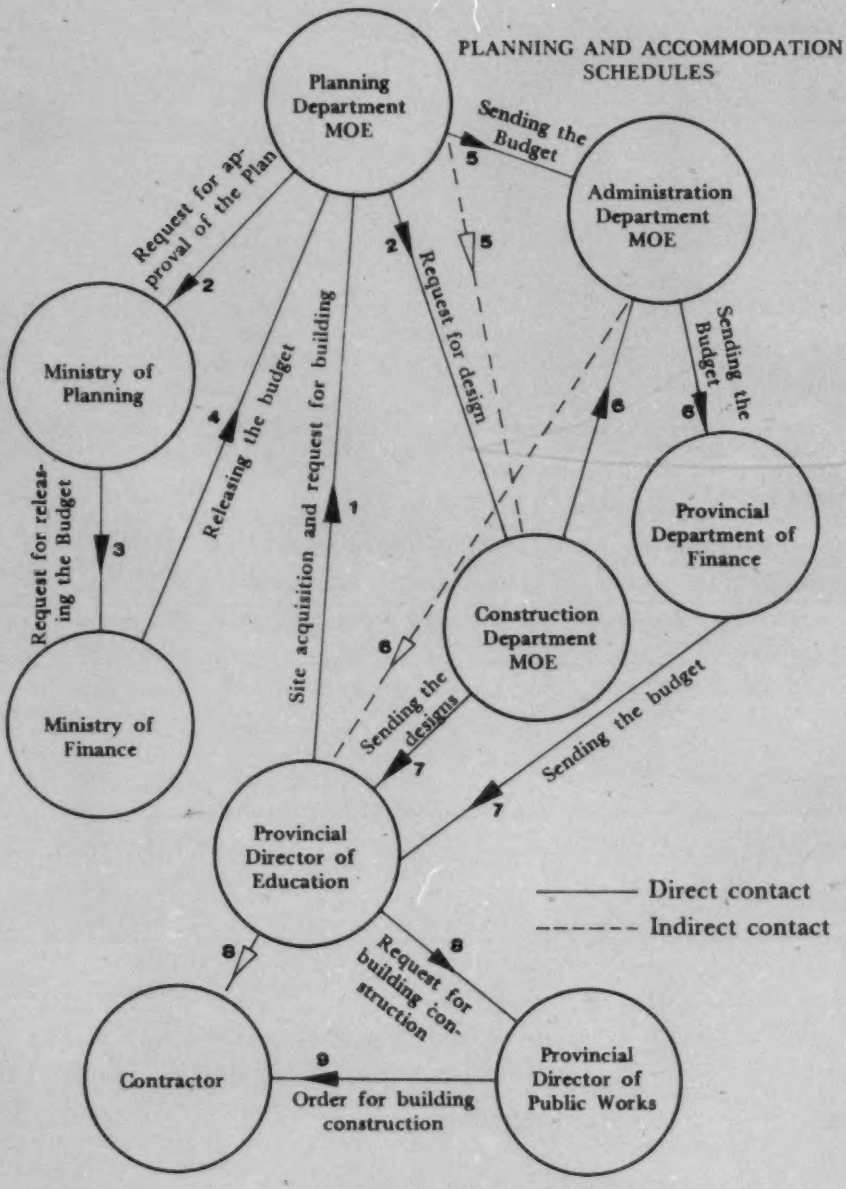
Type of Institution	Primary schools			Secondary schools		
	No. of units	Places provided	Expenditure thousands U.S. $	No. of units	Places provided	Expenditure thousands U.S. $
New schools	1 282*	384 600	17 800	202	60 600	1 540
4-classroom additions	449	56 350	3 100			
Laboratories				200	60 000	800
Libraries				240		720
Toilets	1 282		1 880	202		360

* 8-classroom primary schools

Type of Expenditure	Expenditure in thousands of U.S. dollars	
	Primary schools	Secondary schools
Classroom furniture	6 000	830
Land	565 for 513 hectares	73 for 404 hectares
Water supply per year	230	37



Organigramme showing the procedures followed for buildings financed by foreign aid and the Afghan Government



Organigramme showing the procedures followed for buildings financed directly by the Afghan Government

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

AUSTRALIA

Constitutional authority for education in Australia rests primarily with the six State governments. In recent years, however, the Commonwealth or Federal government has accepted increased financial responsibility in education.

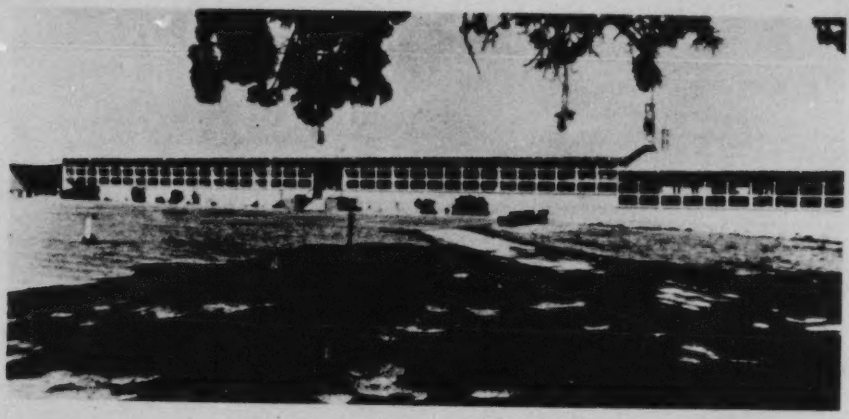
In each State there are Education Acts and related legislation which provide the chief legal basis for the operation of the State Education Departments.

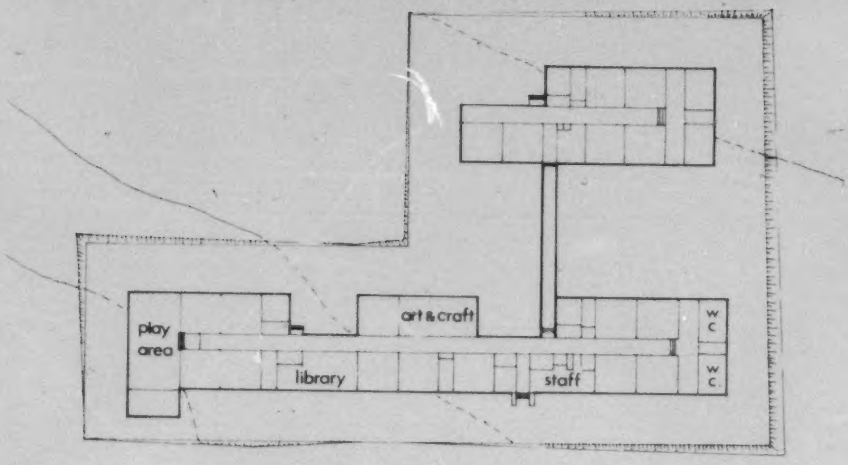
Although the State systems are not identical, they have many similar features. In each State there is a Minister for Education who is responsible to the State Parliament for educational policy-making. The arrangements for education in Australia thus bear resemblance to those of India where education is also a State subject.

It is not possible in the limited space available in the Bulletin to provide data on educational building for all States and the Commonwealth territories, and the Australian National Commission for Unesco has thus provided data for Victoria—the State having, with the exception of Tasmania, the smallest land area and of all States, the highest density of population.

Victoria, with its capital at Melbourne, is located in the Southeast of the country in an area of mediterranean climate. Education in the State comprises six years of primary and six years of secondary schooling.

1. Primary school (Victoria)



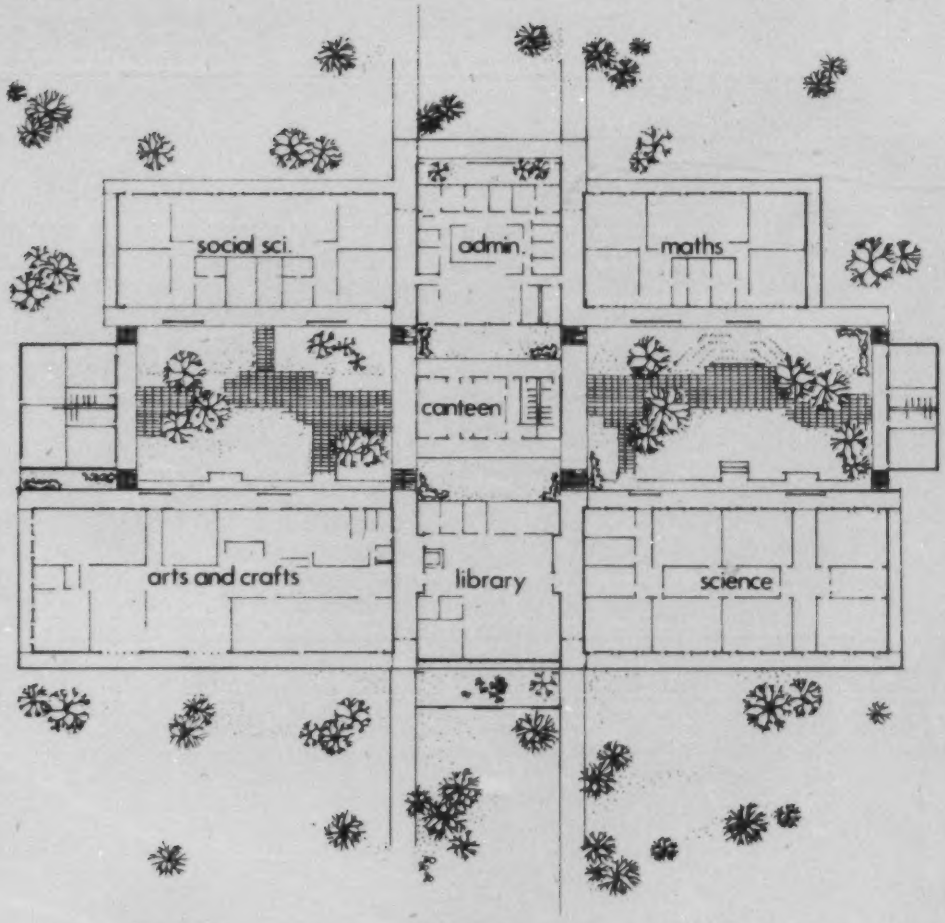


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 600 (maximum)	Construction completed in	1974
Nett covered area	: 2365 m2 (100%)	Cost of building	US $563,680
Nett area teaching spaces	: 1390 m2 (58.77%)	Cost of external work	US $ 88,950
Area administration spaces	: 156 m2 (6.60%)	Building cost per student-place	US $ 939.47
Area of toilets	: 107 m2 (4.52%)		
Circulation area	: 537 m2 (22.71%)		
Other areas	: 175 m2 (7.40%)		
Area per student-place	: 2.94 m2		

Construction: light timber frame with brick veneer.

AUSTRALIA **2. Secondary school (Victoria)**



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 900
Nett covered area	: 8209 m2 (100%)
Nett area teaching spaces	: 4078 m2 (49.68%)
Area administration spaces	: 667 m2 (8.12%)
Area of toilets	: 727 m2 (8.86%)
Circulation area	: 2517 m2 (30.66%)
Other areas	: 220 m2 (2.68%)
Area per student-place	: 9.12 m2

Construction completed in	1971
Cost of building	US $1,353,150
Cost of external work	US $ 82,190
Building cost per student-place	US $ 1,503.50

AUSTRALIA **3. The stock of schools in 1974 (Victoria)**

Type of school	Urban	Rural	Total
Primary	821	1 291	2 112
Secondary	266	192	458
Combined primary and secondary	93	69	162

Ownership	Urban	Rural	Total
Government-owned	834	1 327	2 161
Privately-owned	346	225	571

Type of institution	Primary		Secondary	
	Urban	Rural	Urban	Rural
Schools in permanent buildings	798	1 296	204	162
Schools in temporary buildings	3	8	2	-
Schools in rented buildings	2	14	-	-
Co-educational schools	628	1 165	157	141
Boys' schools	-	-	37	19
Girls' schools	-	-	12	2

Note: The term 'Urban' means Metropolitan Melbourne only.
The term 'Rural' means the rest of the State of Victoria, including other cities.

4. Enrolment in 1974 (Victoria)

Enrolment	Primary		Lower Secondary		Upper Secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
Boys	173 000	76 000	71 000	34 000	41 000	19 000
Girls	165 000	71 000	67 000	32 000	38 000	18 000

Enrolment by grade in all schools

Grade	Urban*		Rural		Total	
	Boys	Girls	Boys	Girls	Boys	Girls
Preparatory	26 000	25 000	12 000	11 000	38 000	36 000
I	25 000	24 000	11 000	10 000	36 000	34 000
II	24 000	23 000	11 000	10 000	35 000	33 000
III	24 000	23 000	10 000	9 000	34 000	32 000
IV	23 000	23 000	12 000	10 000	35 000	33 000
V	24 000	23 000	11 000	10 000	35 000	33 000
VI	24 000	23 000	12 000	11 000	36 000	34 000
VII	24 000	23 000	12 000	11 000	36 000	34 000
VIII	24 000	23 000	12 000	11 000	36 000	34 000
IX	22 000	21 000	11 000	10 000	33 000	31 000
X	19 000	18 000	9 000	9 000	28 000	27 000
XI	14 000	13 000	7 000	6 000	21 000	19 000
XII	8 000	8 000	3 000	3 000	11 000	11 000

* See note on previous page

Retention by grade in all schools

Level/urban or rural		I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Primary	Urban	100	100	100	100	100	100					
	Rural	100	100	100	100	100	100					
Secondary (1970)	Urban							100	100	97	83	62
	Rural							100	99	93	79	56

Average class size	Primary	Lower Secondary	Upper Secondary
General subjects	30.1	-	-
English	-	30.2	25.8

Area in square metres per place in educational areas, based on total enrolment

Type of facility	Primary schools	Secondary schools
Classrooms	1.8	1.55
Laboratories	-	0.70
Arts and Crafts	0.20	0.50
Workshops	-	0.38
Home Economics	-	0.35
Libraries	0.25	0.58
Multi-purpose space	0.25	
Area in hectares per school site	3.24	6.075

Scale of toilet facilities

Boys	Up-to-15	16-30	31-50	51-75	76-100	101-150	151-200	201-250	251-300
Closets	1	1	2	2	3	3	4	5	6
Urinals	1	2	3	4	5	6	7	8	9
Girls	**Up-to-15**	**16-30**	**31-45**	**46-60**	**61-75**	**76-100**	**101-130**	**131-160**	**161-190**
Closets	1	2	3	4	5	6	7	8	9

Note: For numbers exceeding those given in the foregoing table there shall be provided one additional closet and one additional urinal for every 50 or portion of 50 boys, and one additional closet for every additional 30 or portion of 30 girls.

AUSTRALIA

6. Expenditure (US $) (Government schools–Victoria) 1974-1975

Type of expenditure	Primary schools	Secondary schools
Capital expenditure	46 048 000	68 193 000
Furniture and equipment	2 257 000	4 957 000
Land	3 820 000	4 381 000
Maintenance	5 827 000	4 784 000
Electricity and fuel	1 813 000	1 897 000
Transport of pupils	8 365 000	9 271 000
Telephones	56 000	25 000

BANGLADESH

Bangladesh comprises, for the most part, an alluvial plain dominated by three great rivers, the Ganges (or Padma), the Meghna and the Brahmaputra (or Jamuna). It is crisscrossed by smaller rivers and streams to such an extent that, because of the difficulties of road building, most transportation is by water. The shoreline on the Bay of Bengal is highly irregular with spits of land jutting out in many places and, where the Ganges empties into the bay, the coast is deeply indented and has many low offshore islands. The eastern border of the country comprises low hills.

The population of the country in 1970 was given as some 61 million. With an area of more than 140 thousand square kilometres, it will be seen that the population density at 425 per sq. km. is high, exceeded in the Asian region only by that of Singapore.

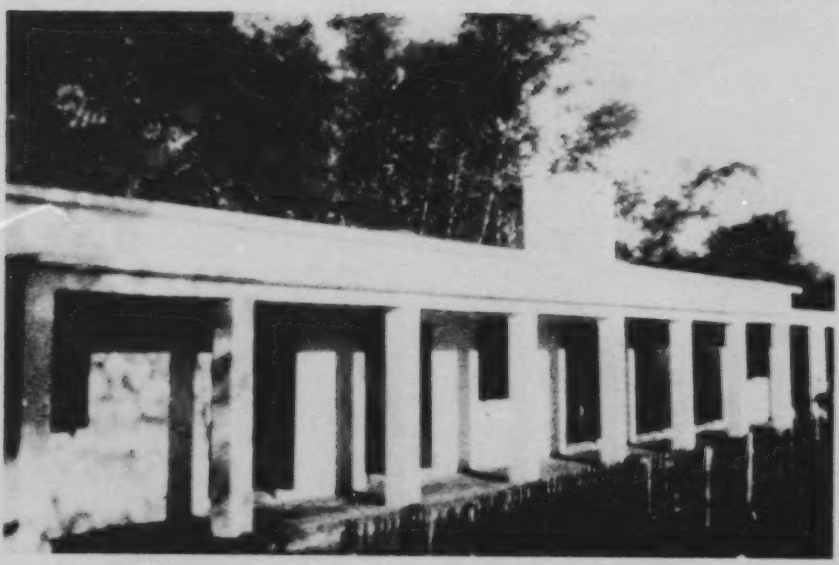
Most of Bangladesh has a hot, humid climate and experiences extremely heavy rainfall. In the northwest there is an earthquake area known as the Barin, while no mention can be made of Bangladesh without reference to its location in the path of the severe tropical cyclones that cause inundation of the coastal areas almost every year. A description of one such cyclone will illustrate the nature of a problem that affects the southern half of the entire country:

> On the night of 12 November 1970, almost the entire coastal zone of Bangladesh was struck by a very severe tropical cyclone. The tidal waves accompanying the cyclone were sufficiently high to breach a substantial 12-foot-high earth wall surrounding the coast and the most exposed islands and, as it swept beyond, buildings were destroyed and human beings and animals drowned. As the eye of the cyclone moved slowly over the area, the winds dropped and the water level rose in some places to a depth of 15 feet above ground level. As the eye passed and the violent winds sprang up again, this water, which had by then formed a large lake over the coastal area, was whipped up into violent waves which completed the destruction of any buildings that had survived the initial shock of the tidal wave.
>
> After the cyclone had spent itself the damage was counted. It seems likely that more than 200,000 people lost their lives. It is certain that at least 4,000 educational institutions were damaged, many of them beyond repair. In addition to this, the water had swept through such schools as had withstood the high winds and washed away books, equipment and furniture.

Like Afghanistan, described earlier in this section, there are very severe constraints to the construction and maintenance of school buildings in Bangladesh. The Deputy Director of Public Instruction describes in Section Three of this Bulletin how the education authorities in the country are attempting to deal with the problem of increasing and repairing the stock of school buildings.

BANGLADESH

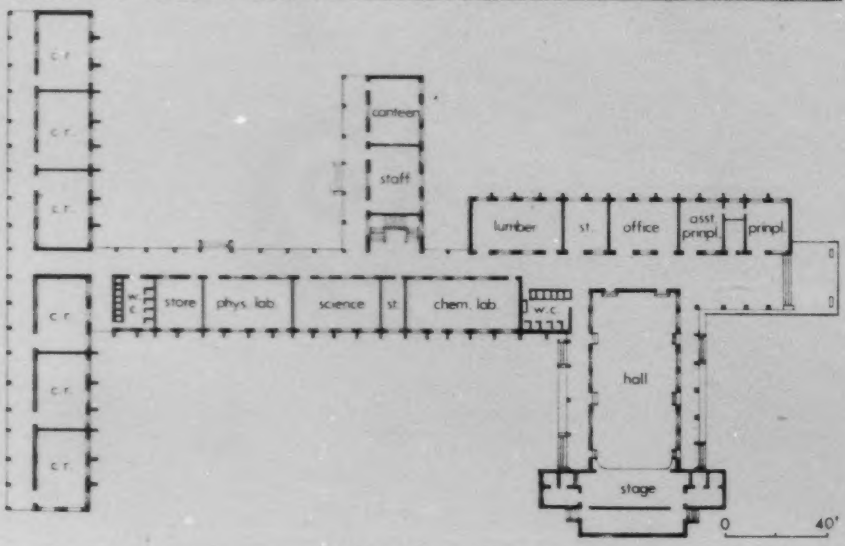
1. Primary school



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 180	Construction completed in 1969	
Nett covered area	: 181.15 m2 (100%)	Cost of land	US $ 573
Nett area teaching spaces	: 144.92 m2 (80%)	Cost of building	US $1,429
Circulation area	: 36.23 m2 (20%)	Building cost, per student-place (1969)	US $ 7.94
Area per student-place	: 1.01 m2		

Construction: concrete foundation and floor, plastered brick walls and reinforced concrete flat roof.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 750	Construction completed in 1967	
Nett area (all floors)	: 3720 m2 (100%)	Cost of land	US $149,000
Nett area of teaching spaces	: 1812 m2 (48.7%)	Cost of building	US $142,900
Nett area of administration spaces	: 484 m2 (13.0%)	Cost of external works	US $ 15,000
Area of toilets	: 134 m2 (3.6%)	Building cost, per student-place (1967)	US $ 190.53
Circulation area	: 1290 m2 (34.7%)		
Area per student-place	: 4.96 m2		

Construction: concrete foundation and ground floor; reinforced concrete first floor and flat roof; walls of load-bearing brick work, plastered.

3. The stock of schools in 1974

Stage of education	Number of schools		
	Urban	Rural	Total
Primary	4 109	32 891	37 000
Lower secondary	702	7 556	8 258
Upper secondary	60	240	300
Total stock	4 871	40 687	45 558

Note: The data include government- and privately-owned schools but exclude some five to six thousand private schools for which data are not available.

Type of institution	Primary		Secondary	
	Urban	Rural	Urban	Rural
Residential schools	...	...	15	...
Co-educational schools	1 340	36 584	325	6 973
Boys' schools	...	...	250	...
Girls' schools	165	434	267	823

Enrolment by grade

Stage	Grade	Boys	Girls	Total
PRIMARY	I	2 268 040	1 193 400	3 461 440
	II	1 052 930	739 580	1 792 510
	III	716 340	527 550	1 243 890
	IV	611 520	296 410	907 930
	V	708 610	217 780	926 390
LOWER-SECONDARY	VI	333 460	127 130	460 590
	VII	274 870	102 830	377 700
	VIII	228 390	83 080	311 470
	IX	223 470	63 100	286 570
	X	183 480	47 880	231 360
UPPER-SECONDARY	XI	40 000	5 000	45 000
	XII	54 610	5 620	60 230

Retention by grade

Stage and type	Grade	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Primary	urban	100	60	50	40	35							
	rural	100	70	60	50	45							
Lower-secondary	urban						20	18	15	11	10		
	rural						18	15	13	9	7		
Upper-secondary	urban											3	15
	rural											7	8

Average size of school in number of pupils

Type of school / Stage	Primary	Lower-secondary	Upper-secondary
Urban	300	400	400
Rural	200	225	300

BANGLADESH 5. Standards and 6. Expenditure, 1965-70

Areas per pupil-place in square metres

Type of area	Primary	Lower-secondary	Upper-secondary
Gross area	0.9	1.1	1.4
Classrooms	0.7	0.9	1.1
Laboratories		1.3	1.6
Sites: Rural schools*	1 335	8 093	12 140
Urban schools*	1 011		

Toilet accommodation: 1 closet per 100 boys, 1 closet per 75 girls

* Areas per school in square metres

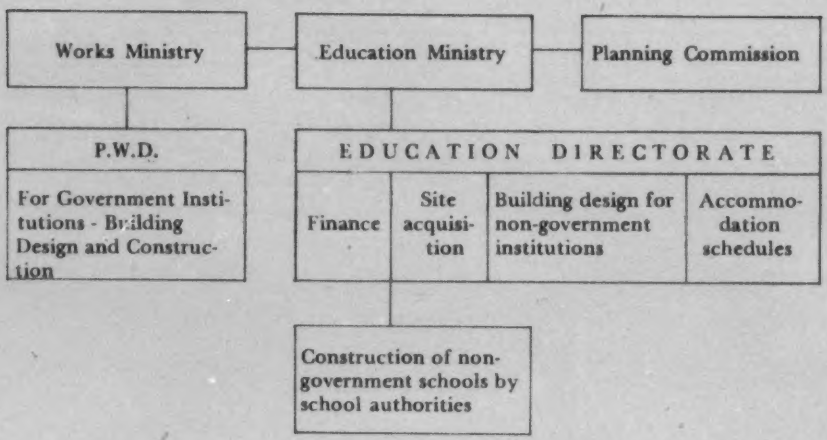
Capital expenditure

Type of expenditure	Primary schools			Secondary schools		
	Number of units	Places provided	Expenditure(US $)	Number of units	Places provided	Expenditure(US $)
New schools	725	145 000	1 087 500	15	9 000	2 317 500
Additional classrooms	5 990	1 198 000	8 557 140	695	110 400	438 720
Laboratories				1 886	75 440	3 377 790

Expenditure on land

	Primary schools	Secondary schools
Total area in hectares	918	10.1
Expenditure, US dollars	3 837 140	107 140

Organization of school building in Bangladesh



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INDIA

India is a Union of 22 States and 9 Territories controlled by the Central or Union Government. Education is a State subject, each State having a minister responsible for the subject of education. It is fortunate that, as this issue of the Bulletin is being compiled, data from the Third All-India Educational Survey have become available. The Survey itself is likely to be published in 1976 and certain material from it is included here.

The arrangement of the data from India is as follows:

1. A description of the 3rd All-India Educational Survey as its findings relate to the population using school buildings and as its findings relate to the schools themselves;
2. Tables giving summary data from the Survey;
3. An account of the educational building situation in two selected States; the largest of all, Uttar Pradesh, in the north, and a typical medium-sized State, Tamil Nadu in the south of the Union.

The Third All-India Educational Survey

The Third All-India Educational Survey was launched in 1973 with much wider scope and coverage than in the first two surveys—which were confined to school education only. It was decided to draw a comprehensive picture of the entire educational scene. The Third Survey therefore covers education from pre-primary to the university stages and includes all types of educational institutions providing academic, technical and vocational education and even including privately-run coaching institutions. The Survey extends also to non-formal education, tribal education and facilities for education of the weaker sections of society as well.

In view of the extended scope and coverage of the survey, it was decided to involve a number of agencies in looking after the different aspects of education as follows:

1. National Council of Educational Research and Training, for *school education*;
2. Institute of Applied Manpower Research, for *technical vocational education*;
3. University Grants Commission, for *higher education*;
4. National Staff College for Educational Planners and Administrators, for *educational administration and supervision*;
5. Department of Culture, Ministry of Education and Social Welfare, for *cultural statistics.*

Under the subject of school education, as in two previous surveys, it was decided to cover every locality in India from the point of view of existing school facilities and also each educational institution, whether officially recognized or not, which provided education up to the school level. Twenty-six schedules were used for collecting the data on various aspects of school education. It was decided to have part of the data processed mechanically in view of the great amount of material collated. As the complete analysis of the survey data is likely to take some more time, only data compiled at the national level are included. Statistics are presented here either in detail or as totals for 21 States and 9 Union Territories. Data for Sikkim, the 22nd State of the country, are not yet available. The figures reported are provisional and subject to revision when the survey is reported in full.

Main findings of the survey

In order to get an idea of the growth in the number of recognized institutions, and the enrolment over the period 1965-73, comparison of these figures with the corresponding figures available from the Second All-India Educational Survey of 1965 has been made wherever possible.

Tables 1 to 4. Table 1 of the survey, reprinted almost in its entirety here, gives the number of primary, middle, secondary, higher secondary schools and intermediate and junior colleges in each State and Union Territory of India. The total number of recognized institutions catering to school education in India in 1973 was 592,088.

Tables 2 and 3 of the survey give the number of schools in rural and urban areas by stage of education, while Table 4 gives the percentage increase in various types of schools since 1965—in rural and urban areas taken together as well as separately in each State. The three tables are here combined in one: Table 2. The percentage increase during the period 1965-73 in the number of primary schools reveals that while in some of the States and Union Territories the emphasis has been on consolidation, in others the emphasis was on expansion.

Another point to observe is the considerable increase in the number of schools in almost all of the States. The overall increase in the number of secondary schools was almost 58 per cent, compared to about 19 per cent in the number of primary schools and 13 per cent in the number of middle schools. Even in the bigger and more populous States, the increase was between 49 and 97 per cent, with the greater growth in the rural areas. The table also reveals that the percentage increase in the number of institutions of various categories in the Union Territories is comparatively higher than the corresponding increase in the States.

Tables 5, 6, 7. Table 5 of the survey gives the total enrolment and the enrolment of girls for the first five grades in various States of India; Tables 6 and 7 give the corresponding enrolment for rural areas and urban

areas respectively, although separate data for a number of States were not available. Data from Table 5 are summarized and presented here as Table 3.

Tables 8, 9, 10. Table 8 of the survey gives the enrolment for classes I to V, VI to VIII and IX-onward, in respect of girls and total enrolment in rural and urban areas of each State and Union Territory of India. Tables 9 and 10 are the corresponding tables for rural and urban areas where data are available.

Table 11. This table gives the percentage increase in the enrolment of boys, girls and total enrolment in grades I-V, VI-VIII, and IX-onward, since 1965, in various States and Union Territories of India. The table reveals that for grades I-V, there is a trend in the positive direction and there has been an increase in enrolment in all of the States and Union Territories. In a number of States, the increase in enrolment in grades I-V is more than 50 per cent over 1965, as against an all-India increase of 23.97 per cent. There has also been a marked increase in enrolment in grades VI-VIII since 1965: about 40 per cent. In many States, the increase in enrolment in grades VI-VIII is more than 50 per cent and, in some of the islands, the increase is more than 100 per cent. In grades IX and onward, there has been an increase in enrolment over that of 1965 in all States except two; the all-India percentage increase in enrolment in these grades is 48.29. The data from Tables 8 and 11 are summarized here as Table 4.

Table 12. This table gives gross enrolment ratios to the respective child population in the years 1965 and 1973. The table reveals that in most of the States the percentage of children in the respective age groups attending the schools is higher than that in 1965. 79.16 per cent children in the age-group 6 to 10+ in India are attending grades I-V, whereas only 34.72 per cent of the children in the age-group 11 to 13+ are attending grades VI-VIII.

Table 13. This table gives the percentage of girl students to the total enrolment in grades I-V, VI-VIII and IX-onward, in the years 1965 and 1973 in various States of India. In the country as a whole, girls' enrolment is 37.64 per cent of the total enrolment in grades I-V, and is only 30.85 per cent of the total enrolment in grades VI-VIII; in grades IX and onward in these grades it constitutes barely 27 per cent of the corresponding total enrolment. In almost all States, nevertheless, the percentage of girls in school in the year 1973 is higher than that in 1965. Data from Tables 12 and 13 of the survey are not presented in this *Bulletin*.

Table 14. This table gives the enrolment in grades II to V as compared to the enrolment in grade I as 100. The table reveals that there is an abrupt fall in the enrolment from grade I to grade II, this fall varying from more than 50 per cent to less than 30 per cent. The ratio of enrolment of grade V to that of grade I for the country as a whole is 31.8:100. Table 14 is presented herein as Table 5.

INDIA **1. The stock of schools in 1973**

Number of schools (rural and urban), 1973

State/Union Territory	Primary	Middle	Sec-ondary	Higher-Sec./ pre-univ.	Interm. jr. college	Total
Andhra Pradesh	37 169	3 714	3 154	2	247	44 286
Assam	20 065	3 163	1 388	35	—	24 651
Bihar	50 573	9 547	2 810	14	50	62 994
Gujarat	22 373*	—	2 535	188**	—	25 096
Haryana	5 283	754	1 008	113	—	7 158
Himachal Pradesh	3 808	886	416	96	—	5 206
Jammu and Kashmir	5 560	1 784	634	56	—	8 034
Karnataka	21 976	11 082	1 960	251	153	35 422
Kerala	7 048	2 575	1 404	13	27	11 067
Madhya Pradesh	49 281	8 512	—	1 969	—	59 762
Maharashtra	35 030	13 534	5 583	195	126	54 468
Manipur	3 180	400	166	21	5	3 772
Meghalaya	3 026	427	134	3	14	3 604
Nagaland	980	272	74	4	—	1 330
Orissa	32 488	4 724	1 954	41	34	39 241
Punjab	9 203	1 215	1 252	272	1	11 943
Rajasthan	19 768	4 804	790	463	4	25 829
Tamil Nadu	26 820	5 790	2 796	48	—	35 454
Tripura	1 479	256	36	70	—	1 841
Uttar Pradesh	63 040	10 296	1 898	31	2 264	77 529
West Bengal	39 741	3 003	2 385	2 316	—	47 445
A. and N. Islands	144	25	—	15	—	184
Arunachal Pradesh	483	59	1	18	—	561
Chandigarh	39	24	25	16	—	104
Dadra and Nagar Haveli	157	—	4	—	—	161
Delhi	1 533	411	—	553	—	2 497
Goa, Daman and Diu	834	155	209	1	8	1 208
L., M. and A. Islands	20	6	6	1	—	33
Mizorma	477	210	98	—	—	785
Pondicherry	286	74	59	—	4	423
Total	461 864	87 702	32 779	6 805	2 938	592 088

* Schools with classes up to VII.

** Pre-university college only.

Table 2. India: number of schools in 1973 by stage of education and type of area, and percentage increase over 1965

Stage of education / Area	Rural	Total, rural and urban	Percentage increase
Primary school	419 651	461 864	18.95
Middle school	73 844	87 702	13.25
Secondary school	22 915	32 779	57.86
Higher-secondary/Pre-university college	2 939	6 805	n.a.
Intermediate/junior college	1 379	2 938	n.a.
Total	520 728	592 088	20.18

Table 3. India: enrolment in grades I to V by grade and sex

Grade / Area	Girls	Both sexes
I	8 268 889	20 889 063
II	5 272 128	13 810 450
III	4 056 071	10 937 066
IV	3 026 959	8 362 970
V	2 201 596	6 642 444

Table 4. India: enrolment of girls and total 1973 by stage of education, and percentage increases 1965-73

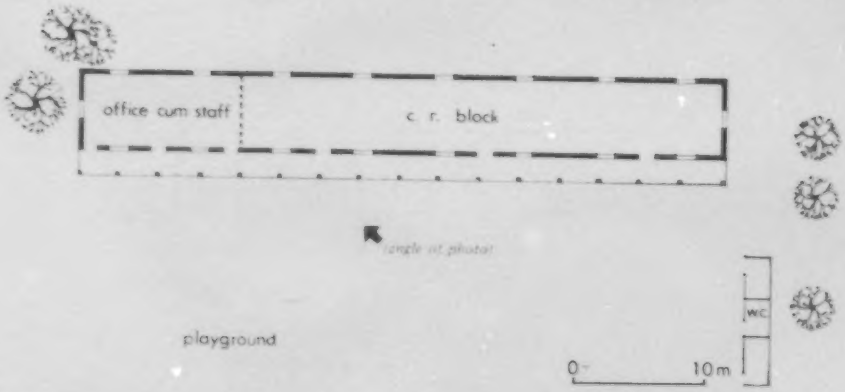
Grades	Girls	%	Total	%
I-V	22 825 643	28.94	60 641 993	23.97
VI-VIII	4 423 754	62.28	14 339 251	39.77
IX-onward	2 092 733	79.51	7 734 604	48.29
Total	29 342 130	30.60	82 715 848	24.18

Table 5. Enrolment in grades II to V as percentage of enrolment in grade I

State/Union Territory \ Grade	I	II	III	IV	V
Andhra Pradesh	100	64.44	52.55	42.18	33.22
Assam	100	44.24	39.70	32.99	27.77
Bihar	100	48.24	37.73	26.24	22.86
Gujarat	100	59.63	45.48	38.29	31.71
Haryana	100	82.81	67.57	57.21	51.33
Himachal Pradesh	100	78.14	68.92	62.26	53.45
Jammu and Kashmir	100	68.73	54.55	48.98	44.86
Karnataka	100	69.56	52.83	40.75	29.53
Kerala	100	111.43	131.70	100.31	84.16
Madhya Pradesh	100	82.85	53.63	31.24	23.98
Maharashtra	100	70.15	52.60	40.75	29.55
Manipur	100	36.78	21.09	19.14	16.42
Meghalaya	100	42.55	32.18	24.37	18.85
Nagaland	100	54.39	47.65	35.84	25.36
Orissa	100	60.09	43.38	29.78	22.95
Punjab	100	79.50	57.28	50.05	41.91
Rajasthan	100	53.61	43.69	33.46	28.00
Tamil Nadu	100	100.00	86.75	73.29	60.76
Tripura	100	48.20	39.55	30.54	24.56
Uttar Pradesh	100	60.97	46.45	35.79	25.79
West Bengal	100	52.00	41.14	28.87	24.41
A.and N. Islands	100	75.84	65.03	57.47	50.92
Arunachal Pradesh	100	44.83	25.47	15.33	9.69
Chandigarh	100	79.90	74.28	66.92	61.52
Dadra and Nagar Haveli	100	40.89	27.68	18.38	15.58
Delhi	100	90.76	84.26	78.76	73.20
Goa, Daman and Diu	100	54.03	44.51	35.83	38.92
L.M. and A. Islands	100	74.32	65.16	57.14	53.57
Mizoram	100	47.94	45.39	39.03	32.67
Pondicherry	100	88.03	79.51	69.33	59.82
ALL INDIA	100	66.11	52.36	40.04	31.80

INDIA - Tamil Nadu

1. Primary school

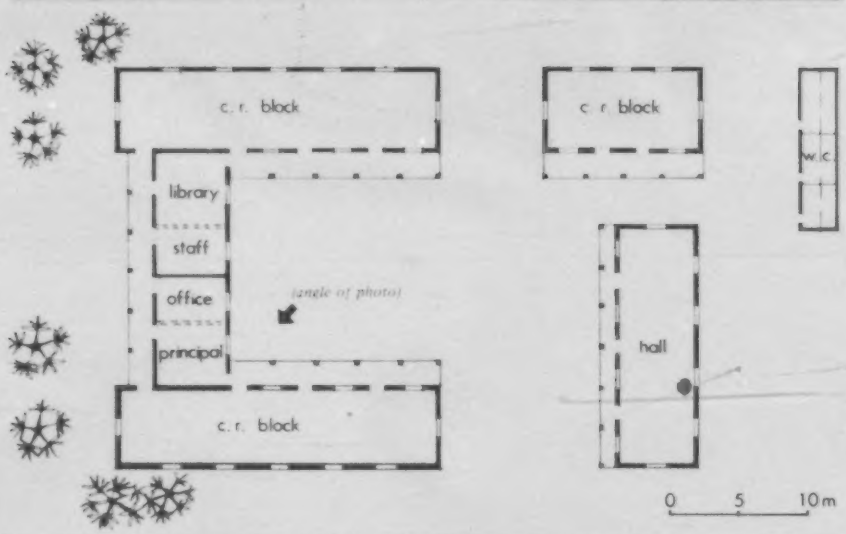


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 659	Construction completed in 1953	
Nett area (all floors)	: 716 m2 (100%)	Cost of land	US $14,000
Nett area teaching spaces	: 476 m2 (66.5%)	Cost of building	US $ 4,000
Nett area administration spaces	: 76 m2 (10.6%)	Cost of external work	US $ 1,250
Circulation area	: 144 m2 (20.1%)		
Area of toilets	: 20 m2 (2.8%)		
Area per student-place	: 1.09 m2	Building cost per student-place	US $ 6.07

Construction: foundations granite in cement mortar; walls in plastered brickwork.

INDIA - Tamil Nadu **2. Secondary school**



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 508	Construction completed in 1954	
Nett area (all floors)	: 807 m2 (100%)	Cost of land	US $37,500
Nett area of teaching spaces	: 571 m2 (70.8%)	Cost of building	US $ 6,250
Nett area administration spaces	: 118 m2 (14.6%)	Cost of external work	US $ 2,500
Circulation area	: 80 m2 (9.9%)		
Area of toilets	: 38 m2 (4.7%)	Building cost per student-place	US $ 12.30
Area per student-place	: 1.59 m2		

Construction: partly granite in cement mortar and partly brickwork in lime mortar.

Enrolment by stage

Sex	Primary		Lower-secondary		Upper-secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
Boys	1 099 000	1 935 000	424 000	413 000	339 000	184 000
Girls	948 000	1 404 000	271 000	191 000	199 000	53 000

Enrolment by grade

Grade	Urban		Rural		Total
	Boys	Girls	Boys	Girls	
I	296 000	263 000	525 000	420 000	1 504 000
II	238 000	204 000	430 000	338 000	1 210 000
III	210 000	190 000	385 000	265 000	1 050 000
IV	190 000	155 000	326 000	217 000	888 000
V	165 000	136 000	269 000	164 000	734 000
VI-VIII	424 000	271 000	413 000	191 000	1 299 000
IX-X	220 000	132 000	128 000	40 000	520 000
IX	84 000	50 000	40 000	12 000	186 000
XII	35 000	17 000	16 000	1 000	69 000

Retention by grade

Stage and type	Grade	I	II	III	IV	V	VI-VIII	IX-X	XI	XII
Primary	urban	100	78	90	86	90				
	rural	100	82	85	84	80				
Lower-secondary	urban						75			
	rural						46			
Upper-secondary	urban							76	76	40
	rural							41	60	25

4. The stock of schools in 1973, and 5. Standards

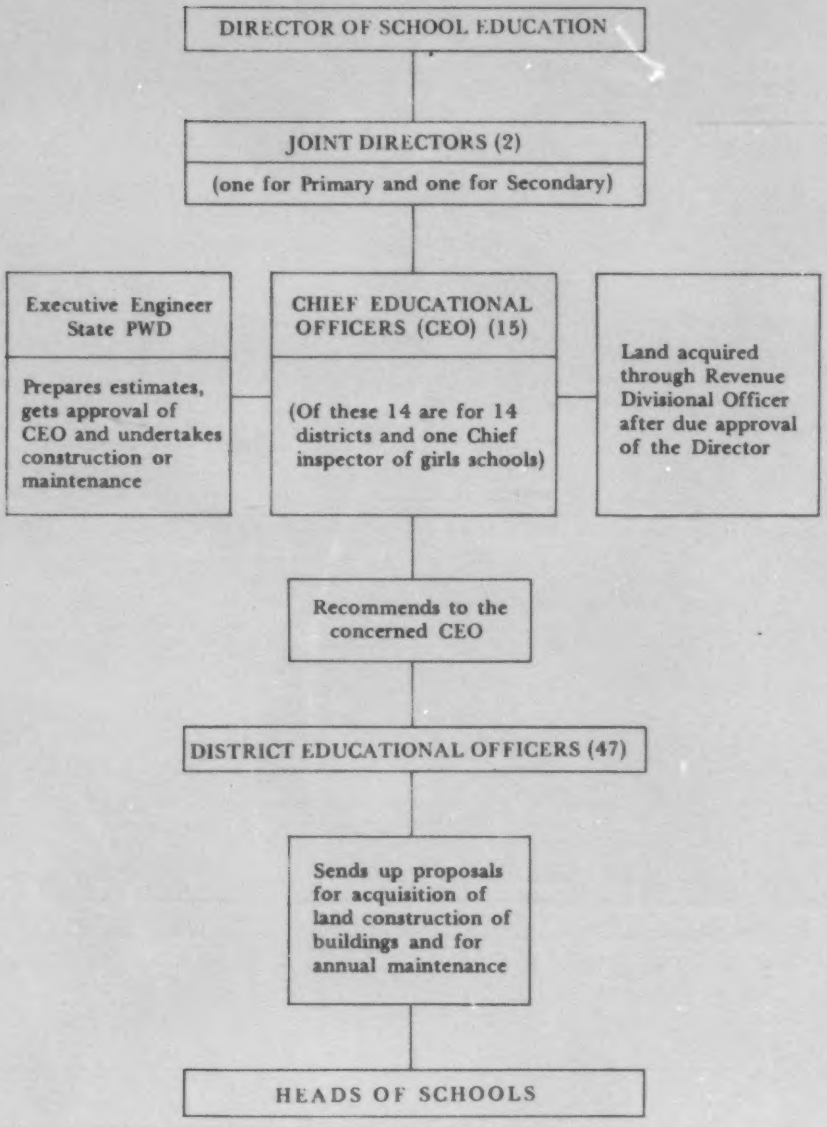
Type of school	Number of schools		
	Urban	Rural	Total
Primary	4 194	22 626	26 820
Lower-secondary (grades VI to VIII)	9	207	216
Upper-secondary (grades IX to XI)	4	81	85
Combined primary and lower-secondary	1 592	3 982	5 574
Combined primary, lower and upper-secondary	84	14	98
Combined lower and upper-secondary	1 203	1 410	2 613
Higher secondary combined with lower and primary (Government owned)	32	4	36
Higher/lower secondary (grades VI to XII)	11	–	11
Higher secondary with pre-university classes	1	–	1

Note: secondary schools in Tamil Nadu have 966 workshops in urban areas, 2,237 in rural areas.

Average space allotments in schools

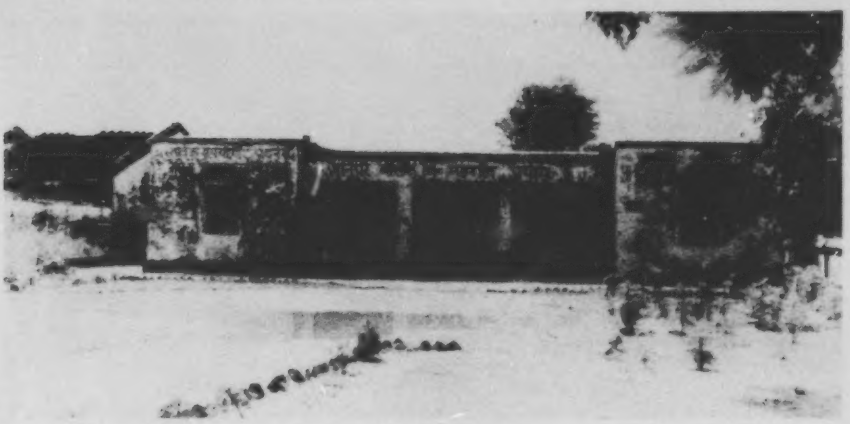
Type of area	Primary	Lower-secondary	Upper-secondary
Classrooms per student-place	0.9 sq. metres	0.9 sq. metres	1.05 sq. metres
Land per school (rural or urban)	0.4 hectares	1.2 hectares	2 hectares

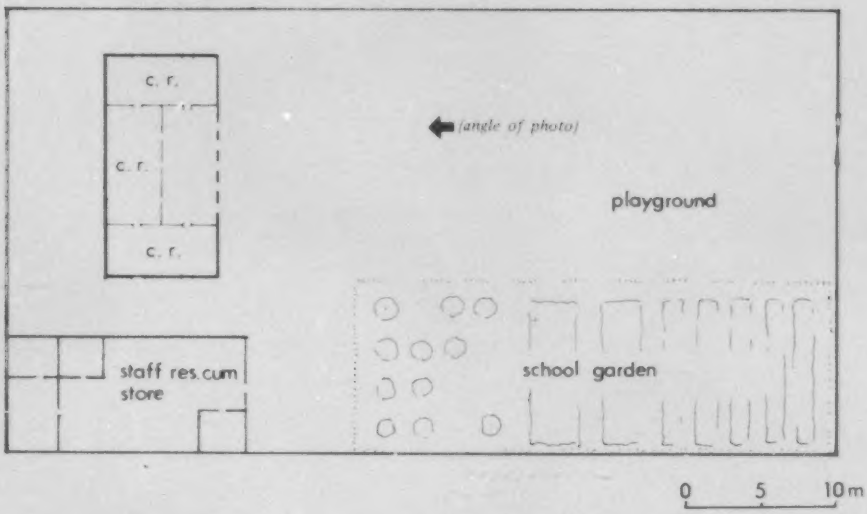
TAMIL NADU EDUCATION DEPARTMENT


DIRECTOR OF SCHOOL EDUCATION
JOINT DIRECTORS (2)
(one for Primary and one for Secondary)
Executive Engineer State PWD
Prepares estimates, gets approval of CEO and undertakes construction or maintenance
CHIEF EDUCATIONAL OFFICERS (CEO) (15)
(Of these 14 are for 14 districts and one Chief inspector of girls schools)
Land acquired through Revenue Divisional Officer after due approval of the Director
Recommends to the concerned CEO
DISTRICT EDUCATIONAL OFFICERS (47)
Sends up proposals for acquisition of land construction of buildings and for annual maintenance
HEADS OF SCHOOLS

INDIA - Uttar Pradesh

1. Primary school—rural



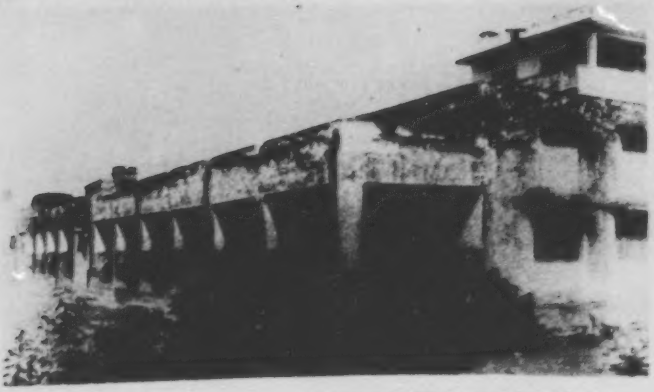


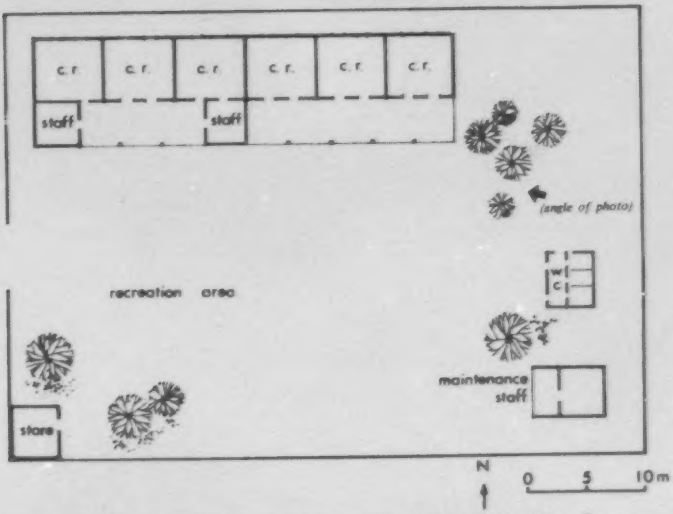
DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 123	Construction completed in 1960	
Nett covered area	: 157 m2 (100%)	Cost of land	US $ 250
Nett area of teaching spaces	: 112 m2 (71.3%)	Cost of building	US $1,000
Area administration spaces	: 45 m2 (28.7%)	Cost of external work	US $ 100
Area per student-place	: 1.28 m2	Building cost, per student-place	US $ 8.13
Area of site	: 1650 m2		

Construction: plastered brickwork in cement mortar.

INDIA - Uttar Pradesh **2. Primary school—urban**



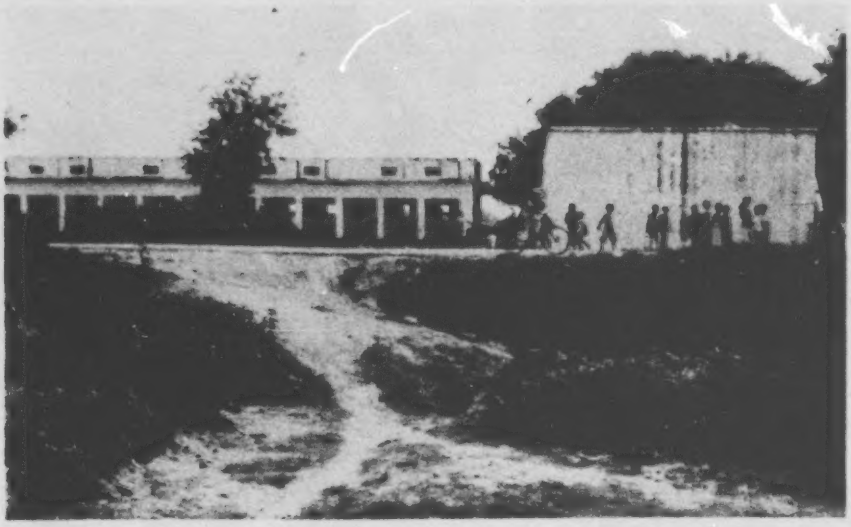


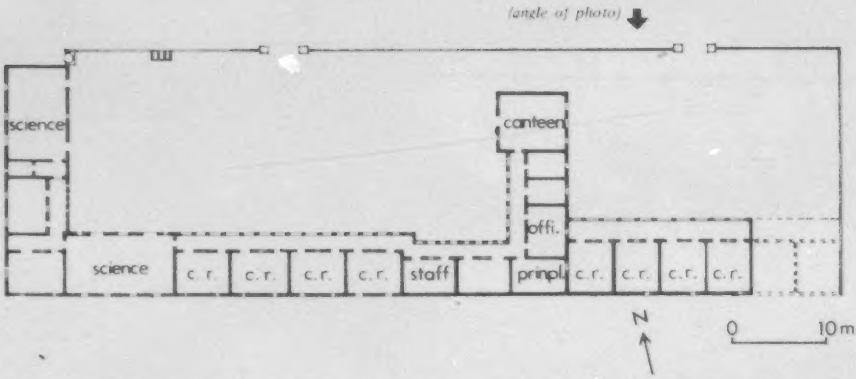
DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 204	Construction completed in 1948	
Nett covered area	: 370 m2 (100%)	Cost of land	US $ 500
Nett area of teaching spaces	: 270 m2 (73%)	Cost of building	US $5,500
Area administration spaces	: 56 m2 (15%)	Cost of external work	US $ 300
Area of toilets	: 18 m2 (5%)	Building cost, per student-place	US $ 26.96
Circulation area	: 26 m2 (7%)		
Area per student-place	: 1.81 m2		
Area of site	: 2100 m2		

Construction: plastered brickwork in cement mortar; reinforced concrete flat roof.

INDIA - Uttar Pradesh **3. Secondary school—rural**



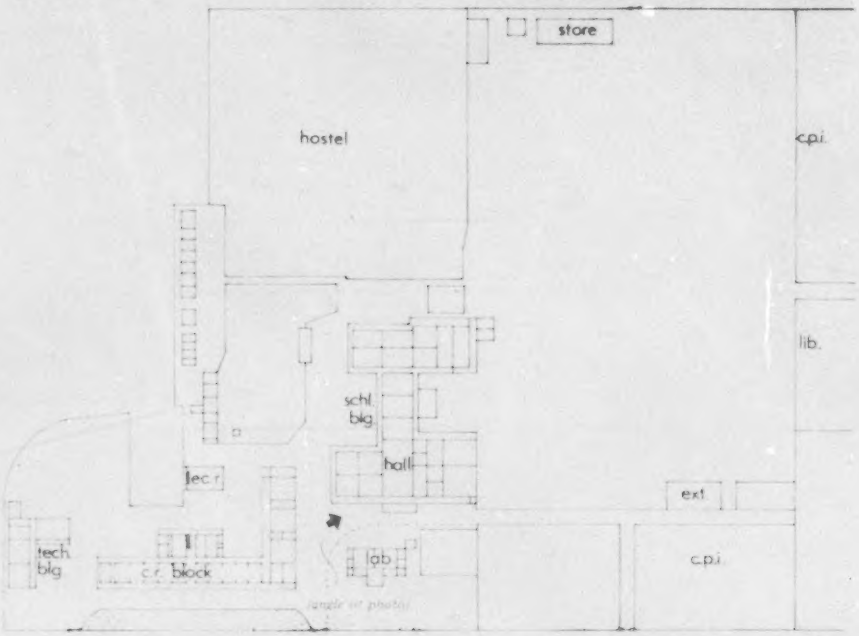


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	:	500		
Nett area (all floors)	:	1217	m2	(100%)
Nett area of teaching spaces	:	945	m2	(77.6%)
Area administration spaces	:	34	m2	(2.8%)
Area of toilets	:	20	m2	(1.6%)
Circulation area	:	218	m2	(18%)
Area per student-place	:	2.43	m2	

Construction from 1943 to 1972		
Cost of land	US $	800
Cost of building	US $	12,000
Cost of external work	US $	3,200
Building cost, per student-place	US $	24

Construction: floors brick; walls plastered brickwork; roof reinforced concrete and some roofs tiled.



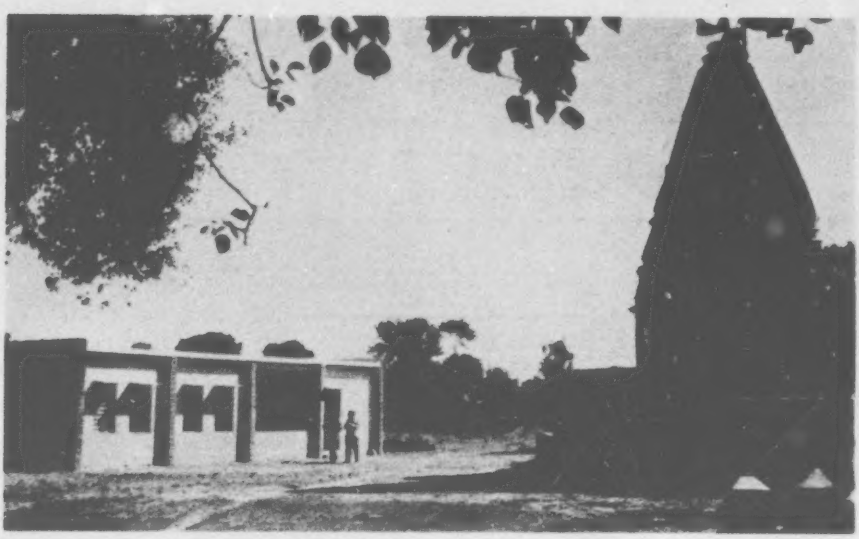
DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	1871	Area of toilets	70 m2 (0.7%)
Nett area (all floors)	9900 m2 (100%)	Circulation area	1410 m2 (14.3%)
Nett area of teaching spaces	8100 m2 (81.8%)	Area per student-place	5.29 m2
Area administration spaces	320 m2 (3.2%)		

Construction: plastered load-bearing brickwork, some flat and some tile roofs.
(The building dates from 1862 with substantial additions made from 1927-40).

Number of schools in 1974

Type of school	Number of schools		
	Urban	Rural	Total
Primary (grades I-V)	6 424	56 601	63 025
Lower-secondary (grades VI-VIII)	1 050	8 226	9 276
Upper-secondary (grades IX-X)	2	7	9
Intermediate (grades XI-XII)	2	–	2
Primary combined with lower-secondary	566	450	1 016
Primary combined with upper and lower-secondary	137	76	213
Combined schools grades I-XII	201	64	265
Combined lower and upper-secondary	359	1 313	1 627
Combined upper-secondary and intermediate	5	–	5
Combined secondary grades VI-XII	823	1 129	1 952



Three-classroom primary school between Roorkee and Saharanpur, Uttar Pradesh. Note the chalkboards used for outside teaching on the walls below the temple.

Enrolment by stage and type

Enrolment	Primary I–V		Lower-secondary VI–VIII		Upper-secondary IX & X		Intermediate XI & XII	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Boys	853 000	5 483 000	432 000	1 264 000	315 000	510 000	193 000	179 000
Girls	576 000	2 631 000	233 000	183 000	115 000	25 000	67 000	5 000

Enrolment by grade and type

Grade	Urban		Rural		Total
	Boys	Girls	Boys	Girls	
I	265 000	178 000	1 991 000	1 110 000	3 544 000
II	177 000	124 000	1 234 000	625 000	2 160 000
III	158 000	109 000	944 000	436 000	1 647 000
IV	138 000	90 000	751 000	298 000	1 278 000
V	116 000	74 000	564 000	159 000	913 000
VI, VII and VIII	432 000	233 000	1 264 000	182 000	2 111 000
IX and X	315 000	115 000	510 000	25 000	965 000
IX and XII	193 000	67 000	179 000	5 000	444 000

Retention rate in primary schools by grade

Type of school	I	II	III	IV	V
Urban	100	67	60	51	42
Rural	100	62	47	34	24

Average size of primary schools and primary school classes

Type	Primary school	Primary school classes
Urban	205	46
Rural	142	29

JAPAN

Japan consists of four main islands and thousands of smaller islands stretching through some 16 degrees of latitude to the semi-tropical regions of the south. With mountains rising as high as 4,000 metres, the terrain is not easy for builders. The geographic location and characteristics of the country expose it to such natural calamities as earthquakes, cyclones, floods and heavy snowfall.

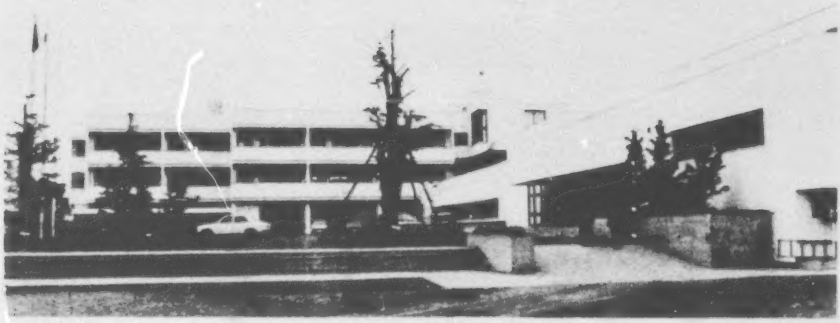
Education in Japan is well advanced, however. Despite the many physical constraints, the school-building industry is well developed and has been able to undertake the major reconstruction programmes that were essential in the post-war period.

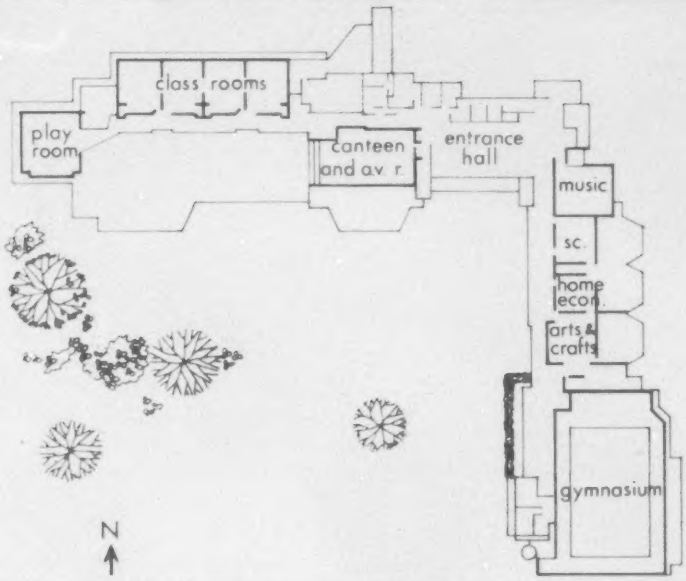
One of the problems that has received special attention is the need to replace the very substantial percentage of wooden schools with buildings of reinforced concrete. Wooden schools were very prone to fire and the new reinforced concrete buildings are not only fire-resistant but designed also to withstand the effects of severe earthquakes.

The Education Ministry is particularly concerned with the school-building problem and has its own Educational Facilities Division which advises on programmes, costs, designs and legislation pertaining to a wide variety of topics including rehabilitation subsidies, reconstruction of unsafe buildings and standards of amenity.

Japan is one of the countries of the region (India being another) having Standards Institutions which have published industrial standards touching such matters as school furniture, design in wood, steel and reinforced concrete and standards for the range of illumination levels to be provided in schools.

Like many countries of the Asian region, Japan, with the growth of its economy and the diversification of industrial organizations in recent years, has experienced a continuing flow of population into the urban industrial areas. This has put a great strain on the school system, and the government has had to concentrate on the problem of constructing new schools, where possible, ahead of the population inflow. Land prices, however, increase rapidly in such new developing areas and hence the cost of education rises. In future it will become increasingly difficult to find urban sites of schools.

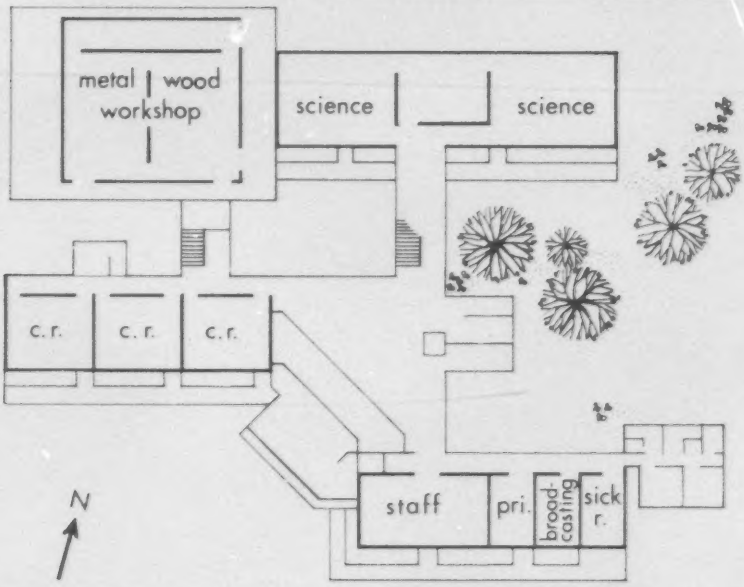




DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	616	Construction completed in	1970
Nett covered area (all floors)	4 958 m2 (100 %)		
Nett area teaching spaces	3 047 m2 (61,5 %)	Cost of land	US $ 29,547
Nett area administration spaces	392 m2 (7,9 %)	Cost of building	US $511,027
Area of toilets	135 m2 (2,7 %)		
Circulation area	1 384 m2 (27,9 %)	Building cost per student-place	US $ 829,59
Area per student-place	8,05 m2		

Construction : reinforced concrete



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	312	Construction completed	1973
Nett covered area (all floors)	4,634 m2 (100%)	Cost of land	US$ 33,333
Nett area teaching spaces	3,164 m2 (68,28%)	Cost of building	US $564,600
Nett area administration spaces	331 m2 (7,14%)	Cost of external works	US $ 97,665
Area of toilets	106 m2 (2,29%)	Building cost per student-place	US$ 1,809,71
Circulation area	1.033 m2 (22,29%)		
Area per student place	14,85 m2		

Construction : reinforced concrete

Number of schools by stage of education

Stage of education	Number of schools
Primary	24 606
Lower-secondary	10 802
Upper-secondary	4 916
Total	40 324

Number of schools according to ownership

Ownership	Number of schools
Government-owned schools	38 372
Privately-owned schools	1 952
Total	40 324

Number of government-owned co-educational schools

Stage of education	Number of schools
Primary	24 444
Lower-secondary	10 241
Upper-secondary	n.a.

Enrolment by stage

Enrolment	Primary	Lower-secondary	Upper-secondary
Boys	5 164 000	2 421 000	2 153 000
Girls	4 925 000	2 315 000	2 118 000

Enrolment by grade

Grade	Boys	Girls	Total
I	953 000	907 000	1 860 000
II	801 000	962 000	1 563 000
III	862 000	823 000	1 685 000
IV	884 000	845 000	1 729 000
V	840 000	800 000	1 640 000
VI	824 000	788 000	1 612 000
VII	811 000	773 000	1 584 000
VIII	800 000	767 000	1 567 000
IX	809 000	775 000	1 584 000
X	768 000	734 000	1 502 000
XI	677 000	679 000	1 376 000
XII	678 000	670 000	1 348 000

Retention by grade

Stage \ Grade	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Primary	100	99.8	99.7	99.6	99.5	99.4						
Lower-secondary							99.4	99.3	99.2			
Upper-secondary										88.4	89.5	85.2

Average size of schools and teaching groups in number of pupils

Type of group \ Level	Primary	Lower-secondary	Upper-secondary
Schools	410	438	868
Teaching groups	32	36	-

Operating relationships of local educational agencies

85

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

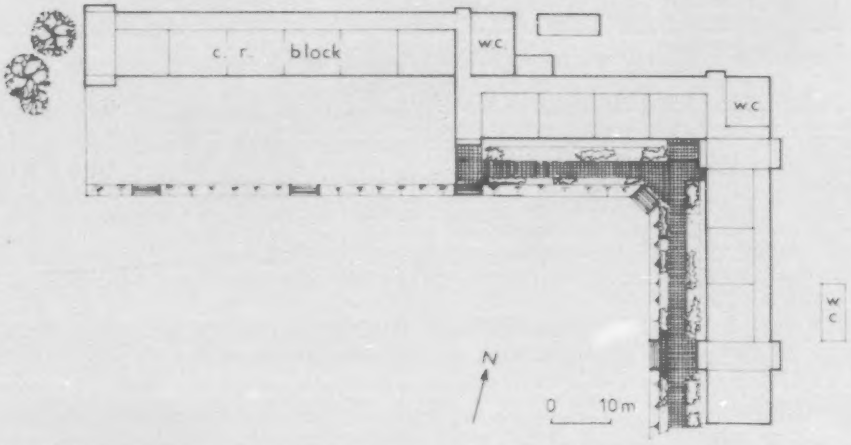
REPUBLIC OF KOREA

The Republic of Korea is a mountainous country with plains, created by rivers on its west coast, which are the most important of the inhabited areas. Off the southwest coast are a number of islands, at least one of which is volcanic. The ruggedness of the east, pressures on available land in the west and a four-month winter period during which heavy snowfall may occur are the main constraints to school building in the Republic. Cyclones from the sea of Japan are fortunately rare.

The central agency for education is the Ministry of Education which includes an office for Educational Facilities. In view of the country's large-scale school building programmes, the Education Ministry has encouraged the use of standardized school building designs. These new designs will, it is hoped, lead to a reduction in construction time and costs. As most of the new buildings will be of reinforced concrete, the advantages of the standardization of an economical design are very apparent. The new schools will also have a lower per-place cost as they will be built with two or three storeys, rather than just a single level.

For the present, as the statistics in the following pages show, some urban schools continue to be characterized by large classes and operation in shifts. This situation will change with time but, despite the difficult physical conditions, Korean educators have not been slow in trying to improve the quality of education through 'large class' studies. In the rural areas where single-teacher schools are still to be found in some places, 'multi-grade' studies are in progress.

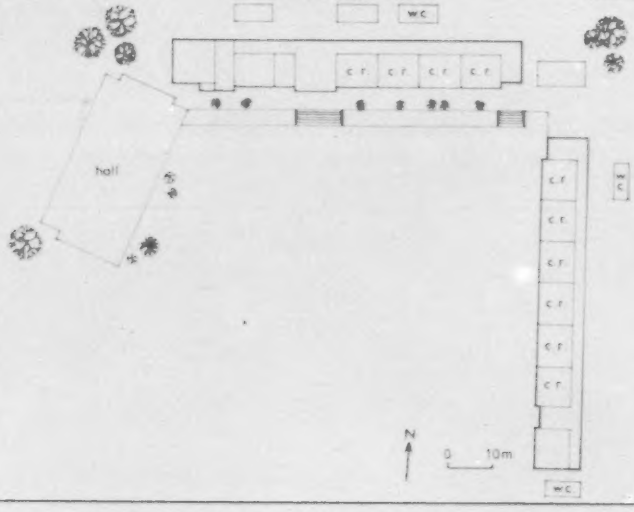
The Republic of Korea, like several other countries of the Asian region, controls the amenity of its schools by law. Presidential Ordinances, amended from time-to-time, prescribe for schools of all levels the minimum size of sites, classrooms and other spaces in the school and make provision for regular inspection to ensure that standards are maintained. This provides good feedback to the central authorities and facilitates the provision of new facilities as those already in use become overcrowded.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	4 861	Construction completed in	1975
Nett covered area (all floors)	6 372 m2 (100%)	Cost of land	US $ 76,000
Nett area teaching spaces	3 510 m2 (55,08%)	Cost of building	US $226,160
Area administration spaces	270 m2 (4,24%)	Building cost per student-place	US $ 46,52
Area of toilets	256 m2 (4,0%)		
Circulation areas	2 261 m2 (35,48%)		
Other areas	76 m2 (1,19%)		
Area per student-place	1,31 m2		

Construction : reinforced concrete structure



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 2 940	Construction completed in	1974
Nett area (all floors)	: 6 717 m2 (100%)	Cost of land	US $107,940
Nett area teaching spaces	: 3 981 m2 (59,27%)	Cost of building	US $131,760
Area administration spaces:	394 m2 (5,87%)		
Area of toilets	: 119 m2 (1,77%)	Building cost per student-place	US $ 44,82
Circulation area	: 1 822 m2 (27,12%)		
Other areas	: 401 m2 (5,97%)		
Area per student-place	: 2,84 m2		

Construction : reinforced concrete structure

Number of schools by stage of education and type

Stage of education \ Type of area	Number of schools		
	Urban	Rural	Total
Primary	832	6 274	7 106
Lower-secondary	389	1 578	1 967
Upper-secondary	342	807	1 149

Number of teaching spaces, and school conditions

Teaching space or school situation	Primary		Secondary	
	Urban	Rural	Urban	Rural
Classrooms	28 828	66 597	-	-
Other teaching spaces	1 438	2 988	-	-
Schools in permanent buildings	832	6 274	-	-
Co-educational schools	832	6 274	271	1 142
Boys' schools	-	-	381	581
Girls' schools	-	-	79	662
Schools operating in two sessions (shifts)	297	-	-	-

Ownership of schools

Government or private	Urban	Rural	Total
Government-owned	986	7 863	8 849
Privately-owned	577	796	1 373

Shortage of facilities

Stage and type of area	Number of rooms needed	
	classrooms	home economics rooms
Primary urban	1 311	1 900
Primary rural	476	4 535

Enrolment by stage of education and type of area

Stage / Sex	Primary		Lower-secondary		Upper-secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
Male	1 130 164	1 723 627	433 303	683 577	368 115	326 445
Female	1 056 345	1 619 525	316 619	539 110	227 080	199 374

Enrolment by grade and type of area

Grade	Urban		Rural		Total	
	Male	Female	Male	Female	Male	Female
I	211 470	195 207	286 692	272 613	498 162	467 820
II	178 445	169 999	279 106	265 895	457 551	435 894
III	183 729	172 799	287 373	270 276	471 102	443 075
IV	179 868	167 073	281 332	261 321	461 200	428 394
V	182 358	172 099	285 227	269 181	467 585	441 280
VI	194 294	179 168	303 897	280 239	498 191	459 407
VII	150 161	112 847	255 680	192 145	405 841	304 992
VIII	144 686	106 494	192 145	181 328	336 831	287 822
IX	138 456	97 278	235 752	165 637	374 208	262 915
X	142 106	85 830	126 020	76 114	268 126	161 944
XI	124 553	76 985	110 454	68 269	235 007	145 254
XII	101 456	64 265	89 971	54 991	191 427	191 256

Index of retention by grade

(The first year of each stage = 100)

Type of area / Stage and grade	Primary						Lower-secondary			Upper-secondary		
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Urban	100	97	96	95	94	93	100	97	94	100	95	95
Rural												

Note: Approximately 70 per cent of primary school leavers enter lower-secondary and approximately 70 per cent of lower-secondary school leavers enter upper-secondary schools.

Average size of classes

Type of area / Stage	Primary	Lower-secondary	Upper-secondary
Urban	36	27	29
Rural	10	13	11

Capital expenditure in thousands of U.S. dollars

Type of building	Primary schools			Secondary schools		
	Number of units	Area in m2	Expenditure	Number of units	Area in m2	Expenditure
New schools or additional classrooms	638	66 990	4 422	486	16 036	3 368
Re-building classrooms	2 150	225 750	12 280	6 139	202 587	36 838
Toilets	65	2 145	144	n.a.	n.a.	n.a.
Other accommodation	n.a.	34 663	4 399	n.a.	n.a.	2 918

Expenditure on furniture in thousands of U.S. dollars

Stage of education	Laboratory furniture	Other furniture
Primary schools	1 422	1 000
Secondary schools	2 663	12 875

Expenditure on land in thousands of U.S. dollars

For 53 primary schools	For 50 secondary schools
3 180	3 000

Expenditure on maintenance in thousands of U.S. dollars

Subject of expenditure	Primary schools	Secondary schools
Buildings	2 873	782
Furniture	11 078	2 452

Sources of funds and amount realized in thousands of U.S. dollars

Stage of education / Source	National budget	Local taxes	School fees
Primary	274 616	–	–
Secondary	62 945	12 379	78 893

Areas prescribed for buildings (in sq. metres)

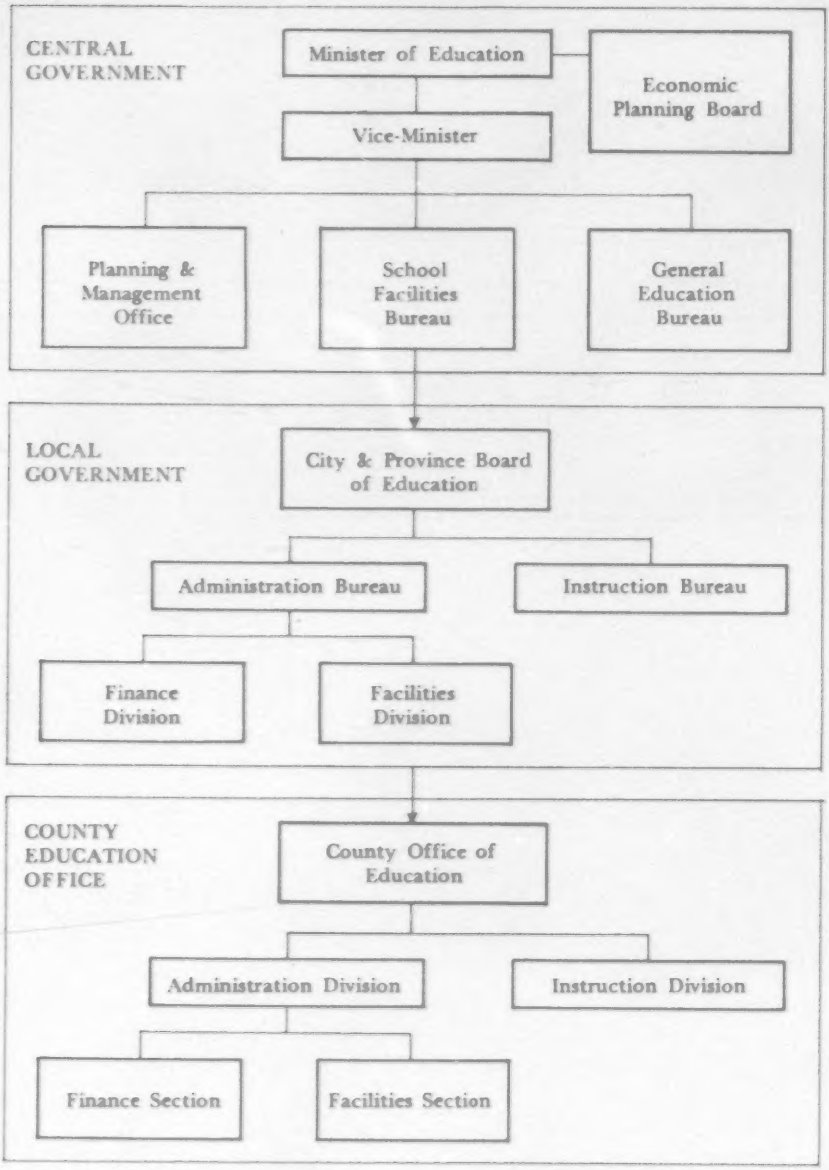
Type of area	In 36-classroom primary schools	In 24-classroom lower-secondary schools	In 18-classroom upper-secondary schools
Classrooms	2 948	1 966	1 474
Laboratories	147	147	147
Audio-visual rooms	124	124	124

Areas prescribed for sites

Type of area	For 36-classroom primary schools	For 24-classroom lower-secondary schools	For 12-classroom upper-secondary schools
Per school (in hectares)			
- rural	1.3	1.2	1.3
- urban	2.0	1.0	1.7
Playgrounds (in sq.metres)	3 250 to 9 752	3 105 to 9 320	4 153 to 8 307
Sports fields (in sq.metres)	9 960	9 100	–

REPUBLIC OF KOREA

ORGANIZATION FOR SCHOOL BUILDING AND FACILITIES



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MALAYSIA

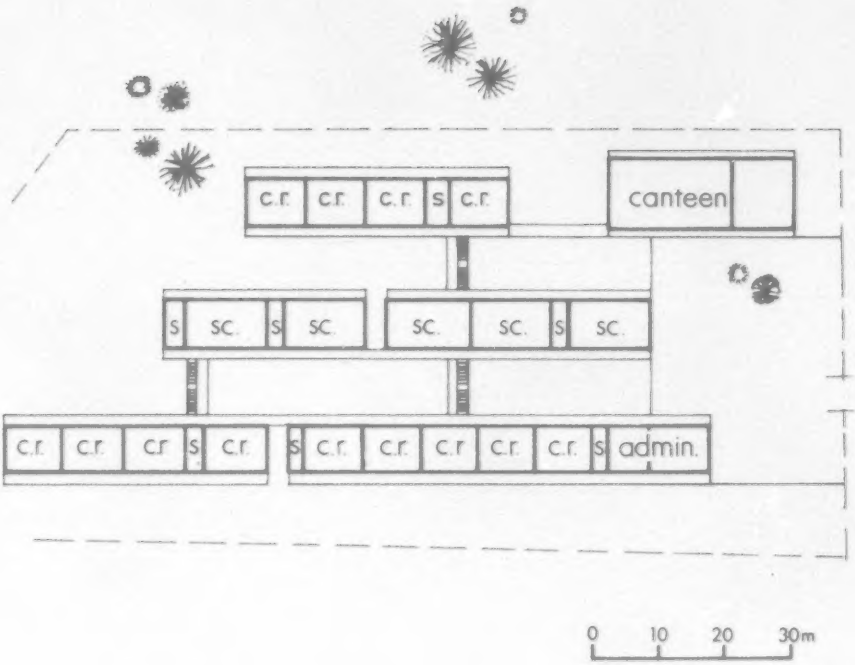
Malaysia comprises two geographically discrete units. West Malaysia is the southern tip of the Asian mainland flanked on one side by the south China Sea and on the other by the Straits of Malacca. East Malaysia is part of the larger island of Borneo, occupying its northern fringe.

The country as a whole is mountainous with coastal lowlands draining into the sea. The lowlands are accessible and cultivated, while the uplands, though occupied, are heavily forested and less densely populated.

School building presents few technical problems in the lowland areas, where there are a wealth of indigenous construction materials and a well organized and effective building industry. In the mountain areas, construction is more difficult, although the abundance of excellent timber provides an adequate resource of material for building.

The administration of school building programmes is highly developed and shared between the central government and the States, with the government approving requests for new schools, controlling land acquisition and regulating tenders for construction. At the State level, site layouts are prepared and the construction of standing buildings which are centrally designed by the Department of Public Works is supervised.

A characteristic of Malaysian school building programmes is that of their tight integration in the educational plan and the high realization of construction programmes in relation to plan targets.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 1 000	Construction completed in	1968
Nett covered area	: 4 298 m2 (100%)	Cost of land (6,88 ha.)	US $20,610
Nett area teaching spaces	: 2 663 m2 (61,9%)	Cost of building	US $87,302
Area of administration spaces	: 824,9 m2 (19,2%)	Building cost per student-place	US $ 87,30
Circulation area	: 810 m2 (18,9%)		
Area per student-place	4,3 m2		

Construction: reinforced concrete frame and floors; unplastered walls, one half brick thick (12 cm.); roofs asbestos sheet on timber trusses.

Number of schools by stage of education

Stage of education \ Type of area	Urban	Rural	Total
Primary	770	3 553	4 323
Lower-secondary	68	169	237
Combined lower and upper-secondary	317	256	573

Number of teaching spaces in schools

Teaching space \ Stage, type of area	Primary		Secondary	
	Urban	Rural	Urban	Rural
Classrooms	9 707	22 170	7 236	5 931
Laboratories			1 316	865

Number of schools according to type of institution

School situation \ Stage	Primary	Secondary
Co-educational schools	4 109	643
Boys' schools	99	69
Girls' schools	115	98
Schools operating in two shifts	1 123 (25.9%)	513 (63.3%)

Enrolment by sex and stage of education

Sex \ Stage of education	Primary	Lower-secondary	Upper-secondary
Male	817 289	309 567	103 943
Female	769 620	251 904	77 119

Enrolment by grade in all schools

Grade	Boys	Girls
I	143 583	140 068
II	139 161	131 254
III	140 210	132 317
IV	132 405	124 511
V	133 981	125 350
VI	127 949	116 120
VII	136 401	111 640
VIII	91 913	75 511
IX	81 253	64 753
X	49 111	37 203
XI	45 476	32 937
XII	5 299	4 014
XIII	4 057	2 965

Average class-size for general subjects

Primary	Lower-secondary	Upper-secondary
36	40	35

Average size of school by type of area and stage of education

Type of area \ Stage of education	Primary	Secondary
Urban	730	1 007
Rural	277	618

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NEPAL

Like Afghanistan and parts of India and Pakistan, Nepal presents considerable difficulty to those responsible for the equitable provision of school buildings. A seismic area, half of which is more than 1,500 metres high, and with substantial areas above 4,500 metres, the country comprises a long east-west rectangle with rivers draining from north to south. One who travels from one end of the country to the other thus has the option of climbing and descending for weeks, or of going down a river valley to the flat area near the border with India, and then travelling along the border until he reaches the point at which he can turn north up the valley he has to reach. This explanation is simplified somewhat but serves to explain the considerable difficulties faced in getting materials to sites for building as well as of sending teaching material, let alone teachers and inspectors, to schools.

Nepal has 16 town 'panchayats', which constitute the urban areas, although many schools serving the urban students are on the outskirts of these town panchayats. At the same time a large number of rural students attend urban-based secondary schools either by daily commuting or by renting rooms in the urban areas. Thus, while no estimates are made for the urban and rural enrolments separately, the size of urban-based schools has nevertheless been given.

All schools in the country come under District Education Committees which are semi-governmental bodies working under one or the other of 75 District Education Offices (the schools are however not deemed to be government schools). The government is responsible for the payment of 100 per cent of primary teachers' salaries, 75 per cent of lower-secondary teachers' salaries and 50 per cent of the salaries of upper-secondary school teachers. The teachers are employees of the District Education Committees, and are not civil servants.

Shortage of facilities

Most schools, especially primary schools and those in the rural areas, are short of standard classroom space. Laboratories, workshops and libraries are almost non-existent in the primary schools. Nearly all secondary schools have permanent buildings, but the classrooms are crowded.

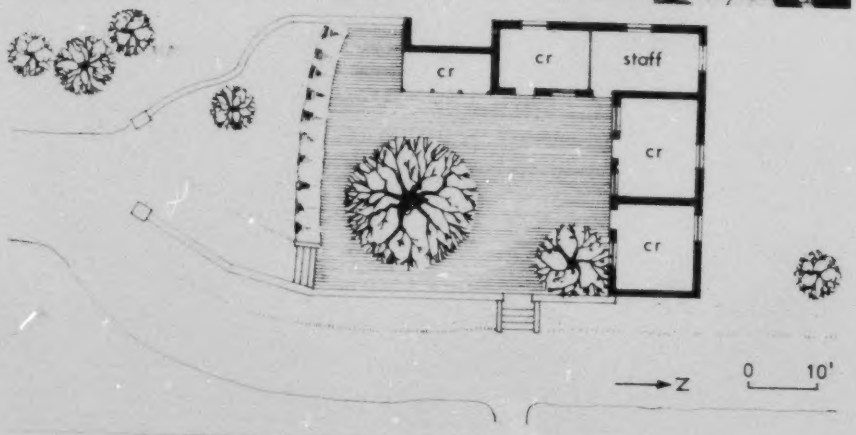
Each secondary school has one vocational workshop which is used for the teaching of one compulsory vocational subject assigned to the school, except in cases where Education and Accounts are the subjects offered. Home Economics, and Arts and Crafts are among the vocational courses offered in the secondary schools, although under varying subject categories. Large, well-established secondary schools have laboratories for science teaching and collections of books for use by students and staff.

Funding of construction

1. Four sources are noteworthy :
   a) Appropriations from government budget for the revolving fund, and for the construction of vocational workshops;
   b) Appropriations made by District Education Committees for the schools, based mainly on the amount of school fees collected by the schools;
   c) Loans from the revolving fund meant for construction purposes only ;
   d) Community assistance in the form of materials, land, labour and financial contributions.
2. The amount shown under the National Budget column is the total expenditure on education (Regular and Development together).
3. The amount shown under the Foreign Aid column is the total Unesco/UNICEF aid approved for the year 1974/1975.
4. The school fees (tuition) collected by the schools are pooled into the Exchequer of the District Education Committees.

NEPAL

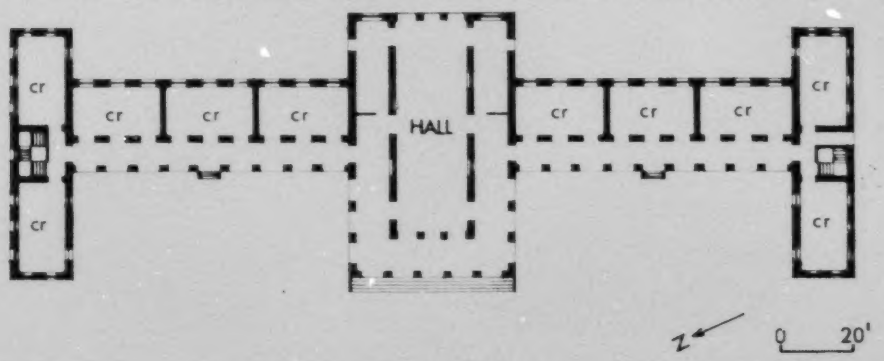
1. Primary school



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	105	Construction completed in	1969
Nett covered area	61.2 m2 (100%)	Cost of land	US $ 500
Nett area of teaching spaces	51.7 m2 (84.5%)	Cost of building	US $2,200
Area of administration spaces	5.3 m2 (8.7%)	Cost of external work	US $ 240
Area of toilets	4.2 m2 (6.8%)	Building cost per student-place	US $ 20.95
Area per student-place	0.58 m2		

Construction: cement plastered brick walls, corrugated iron roofing.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	1 200	Construction completed in	1962
Nett area (all floors)	1 879 m2 (100%)	Cost of land	US $140,000
Nett area of teaching spaces	1 240 m2 (66,47 %)	Cost of building	US $180,000
Nett area of administration spaces	57 m2 (3,03 %)	Cost of external work	US $ 1,000
Area of toilets	59 m2 (3,14 %)	Building cost per student-place	US $ 16,77
Circulation area	514 m2 (27,35 %)		
Area per student-place	1,46 m2		

Construction: brick walls, plastered internally, concrete flooring.

Number of schools by stage of education

Type of school according to stages	Number of schools
Primary	7 983
Lower-secondary	1 483
Upper-secondary	459
Primary combined with lower-secondary	818
Primary combined with lower- and upper-secondary	172
Lower- combined with upper-secondary	263

Number of teaching spaces in schools

Type of space \ Stage	Primary	Secondary
Classrooms	15 966	6 203
Laboratories		157
Workshops		355
Libraries		323

Number of schools according to buildings and type by residence and sex

Type of school \ Stage	Primary	Secondary
Schools in permanent buildings	4 335	1 650
Schools in temporary buildings	3 648	292
Residential schools	–	105
Co-educational schools	all	1 889
Wholly boys' schools	–	28
Wholly girls' schools	–	25

Shortage of facilities

Stage \ Type of facility	Classrooms	Laboratories	Libraries
Primary	7 983	–	–
Secondary	1 683	302	136

Number of pupils by sex and stage of education

Sex \ Stage of education	Primary	Lower-secondary	Upper-secondary
Male	332 000	134 000	51 000
Female	69 000	26 000	11 000

Enrolment by grade and sex

Grade \ Sex	Male	Female	Total
I	194 000	42 000	236 000
II	74 000	16 000	90 000
III	64 000	12 000	76 000
IV	45 000	9 000	54 000
V	36 000	7 000	43 000
VI	29 000	5 000	34 000
VII	25 000	4 000	29 000
VIII	20 000	4 000	24 000
IX	16 000	4 000	20 000
X	14 000	3 000	17 000

Index of retention by grade

Stage of education and grade	Primary			Lower-secondary				Upper-secondary		
	I	II	III	IV	V	VI	VII	VIII	IX	X
Index	100	43.6	38.6	29.7	26.0	17.1	15.4	13.8	12.1	11.7

Average size of class by subject, stage of education and area

Subject matter \ Stage and type of area	Primary		Lower-secondary		Upper-secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
For general subjects	33	13	28	20	75	25
For science subjects	33	13	28	20	75	25
For practical subjects	–	–	–	–	50	25

Average size of school in number of pupils

Type of school \ Type of area	Urban	Rural
Primary	100	40
Lower-secondary	110	80
Upper-secondary	225	75
Combined primary and lower-secondary	240	156
Combined primary and lower- and upper-secondary	600	300
Combined lower- and upper-secondary	400	250

Expenditure in US dollars for schools, classrooms and workshops

Type of expenditure \ Level	Primary schools	Secondary schools
New schools	190 150	516 130
Addition of classrooms	41 540	33 900
Workshops	–	439 900

Other expenditure in US dollars

Type of expenditure \ Level	Primary schools	Secondary schools
Classroom furniture	4 690	10 900
Playgrounds and hostels	1 300	26 700
Maintenance of buildings	2 022	7 330

Sources and amount of funds in US dollars

National budget	School fees	Foreign aid
15 884 000	2 586 300	161 400

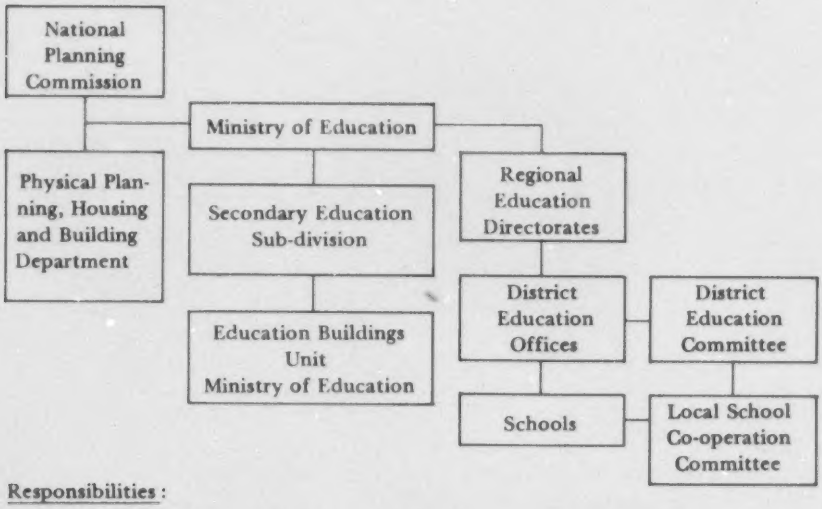
Per-place areas in square metres in school sectors by stage of education

Type of area \ Stage	Primary	Lower-secondary	Upper-secondary
Gross area of school	0.94	1.08	1.31
Classrooms	0.75	0.85	0.85
Laboratories	–	–	1.30
Workshops	–	–	2.70
Home economics rooms	–	–	2.70
Staff rooms	0.065	0.065	0.10
Library and store	0.065	0.065	0.10
Playgrounds	3.0	4.0	4.0
School gardens	2.0	3.0	3.0
Sports	3.0	4.0	4.0
Sites (approximately)	7.0	10.0	10.0

Scale of toilet accommodation in primary and secondary schools

Sex \ Accommodation	Closets	Urinals	Wash basins
Male	1 per 48	1 per 32	1 per 32
Female	1 per 24	–	1 per 48

ORGANIZATION FOR SCHOOL BUILDING



Responsibilities:

National Planning Commission
Approval of the five-year and annual plans.

Ministry of Education (Secondary Sub-division)
Control of financing and design of workshop buildings.

Education Buildings Unit
Design of buildings for vocational workshops and for general schools.

Regional Education Directorates
Distribution of money for construction of workshops.

District Education Offices
(a) Acquisition of site and supervision of construction;
(b) Operation of revolving fund for building construction.

District Education Committee
Survey of the construction needs of the schools and recommendation for the allotment of financial assistance to the schools.

Schools
(a) Direct involvement in building construction;
(b) Request for additional accommodation and loans from the revolving fund.

Local School Co-operation Committee
Local co-operation for building construction in the form of money, labour, land and local materials.

Physical Planning, Housing and Building Department
Provision of engineers and technicians to the Education Buildings Unit.

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

NEW ZEALAND

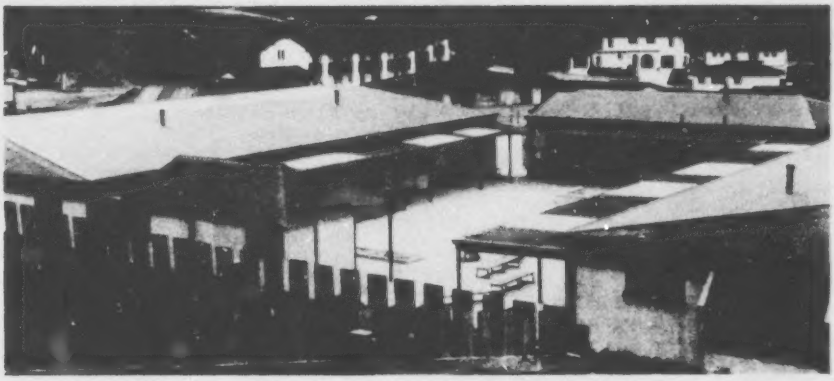
Education in New Zealand is the responsibility of the Department of Education, which is a Department of State under the control of the Ministry of Education. The Department is charged with the administration of the Education Act, 1964 and its amendments, and with regulations made under the Act. As there is no local rating for education in New Zealand, all expenditure on public primary and secondary education, except for a very small amount of endowment income, is from funds provided by the central government through the Department of Education.

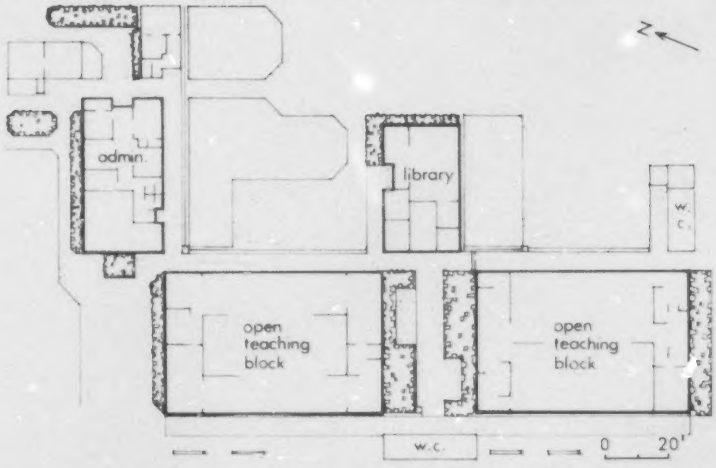
New Zealand is one of the few countries in the Asian region which vigorously controls the capital expenditure of schools and of the amenity provided. In 1956, a scheme for controlling the cost of primary school buildings, based very broadly on the British system, was introduced. Known as the 'white lines' scheme, it gives educational boards the freedom to design schools within a framework of maximum costs as the upper line, and a code of minimum standards of facilities as the lower line. The code is known as the Minimum Code for New Primary Schools (1956) and it prescribes, *inter alia,* sizes of sites, areas of classrooms and head teachers' rooms, a scale for lavatories and other accommodation.

Although the country has a well developed building industry and a building research establishment of international repute, school building presents some unique problems. First, most of the country is subject to earthquakes, a factor which has implications for the constructional design of schools. Second, the country comprises a series of islands spread over an area substantially larger than that of India (it includes the Cook Islands, more than 2,000 miles from the capital).

New Zealand has operated for many years a Correspondence School whose function is to provide education for children and adults who are unable to attend regular schools or other educational institutions. Students may live in remote country districts or may be unable to attend schools because of ill health or physical disability. In addition, children of New Zealanders serving abroad in official capacities are enrolled at the Correspondence School. The total roll at the beginning of 1975 was 8,436 (this figure is included in the data sheet). The Correspondence School is at present housed in temporary accommodation in central Wellington, but construction has begun on a new building—also in Wellington—and this is planned to open in 1977.

The data provided in the pages that follow refer only to State schools (Government-owned) unless otherwise indicated. The Government grants some financial aid to private schools and at present there is legislation pending which will enable private schools to become integrated into the State education system if they wish.





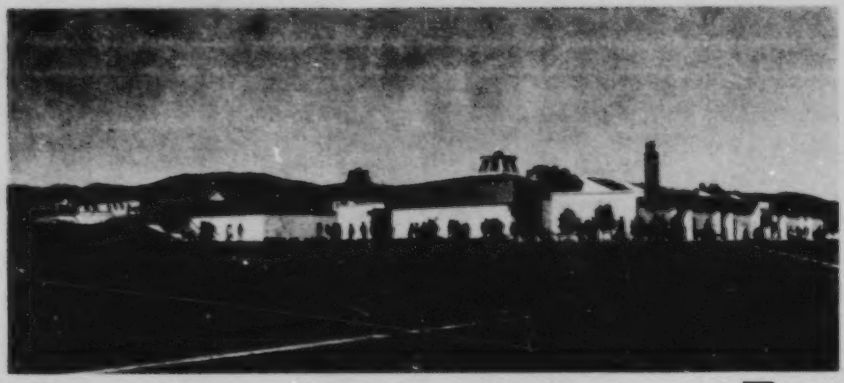
DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

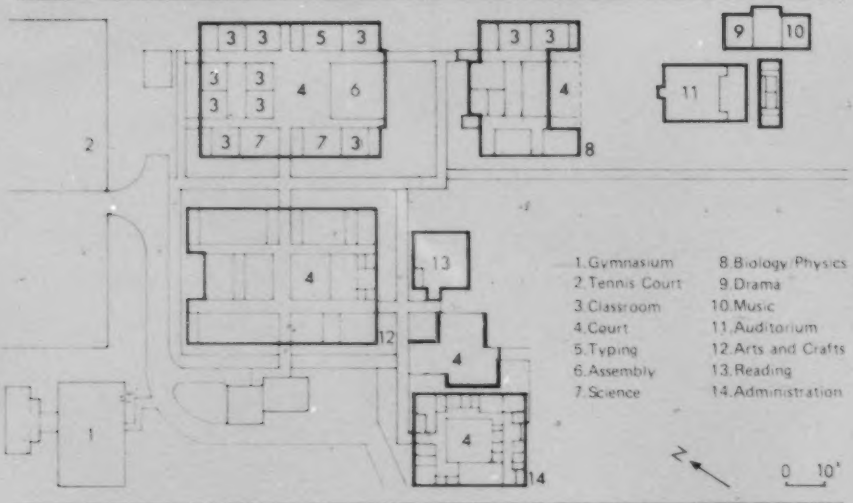
Number of students	: 280
Nett covered area	: 969.02 m2 (100%)
Nett area of teaching spaces	: 607.84 m2 (62.73%)
Nett area of administration spaces	: 143.26 m2 (15.30%)
Area of toilets	: 57.41 m2 (5.92%)
Library	: 99.96 m2 (10.32%)
Dental clinic	: 27.87 m2 (2.88%)
Boiler house	: 27.68 m2 (2.86%)
Area per student-place	: 3.46 m2

Construction completed in 1973

Cost of land and development	US $ 40,314
Cost of building and heating	US $272,883
Cost of external work	US $ 21,395
Building cost per student-place	US $ 974.58

Construction: concrete floor, timber and steel frame; timber roof trusses.





DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	604	Construction completed in	1973
Nett covered area	6 447,42 m2 (100%)	Cost of land	US $ 52,630
Nett area of teaching spaces	4 068,60 m2 (63,10%)	Cost of building	US $1,431,536
Nett area of administration spaces	789,67 m2 (12,25%)	Cost of external work	US $ 56,341
Area of toilets	189,15 m2 (2,93%)	Building cost per student-place	US $ 2,370,09
Circulation area	1 400,00 m2 (21,71%)		
Area per student-place	10,67 m2		

Construction: concrete floor; double cavity concrete-block external walls; steel-lattice roof beams.

Number of schools by stage of education and type of area

Type of school according to stages \ Type of area	Urban	Rural	Total
Primary			2 420
Lower-secondary			133
Upper-secondary	208	106	314
Combined primary and lower- and upper-secondary		49	49
Combined lower- and upper-secondary		31	31
Total government-owned schools			2 947
Privately-owned schools	329	108	437

Number of schools by sex of population

Type of school \ Level of education	Primary	Secondary
Residential schools with hostels attached		108
Coeducational schools	2 460	239
Boys' schools	50	71
Girls' schools	38	84

Enrolment by sex and stage of education

Sex \ Stage	Primary	Lower-secondary	Upper-secondary
Male	229 800	39 600	106 000
Female	216 400	37 800	102 600

Enrolment by grade and sex

Grade \ Sex		Male	Female	Total
Unclassified		1 300	1 000	2 300
PRIMARY EDUCATION	I	72 200	67 000	139 200
	II	31 100	29 900	61 000
	III	31 700	29 900	61 600
	IV	32 300	30 200	62 500
	V	32 900	31 300	64 200
SECONDARY EDUCATION	VI	34 100	32 500	66 600
	VII	33 900	32 500	66 400
	VIII	33 100	32 100	65 200
	IX	30 000	28 700	58 700
	X	25 900	26 200	52 100
	XI	12 800	12 700	25 500
	XII	4 300	2 800	7 100

Retention by grade

Primary					Lower-secondary		Upper-secondary				
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
100	100	100	100	100	100	100	100	94	90	45	12

Average size of classes and school populations

Type of group \ Stage	Primary and lower-secondary	Upper-secondary
Teaching groups—all subjects	31	24
Schools	210	530

Capital expenditure in thousands of US dollars on new schools and additions to existing schools

Primary schools	Secondary schools
22 364	28 015

Expenditure in US dollars on furniture, land and maintenance

Type of expenditure \ Level	Primary schools	Secondary schools
Furniture and equipment	1 975 872	1 802 331
Land	2 697 897	1 467 914
Maintenance of buildings	6 682 876	3 758 489

Recurrent expenditure in US dollars by service

Level \ Service	Electricity and water	Telephones	Transport	Other
Primary schools	794 713	183 152	10 941	273 901
Secondary schools	564 194	...		

... = Information not available.

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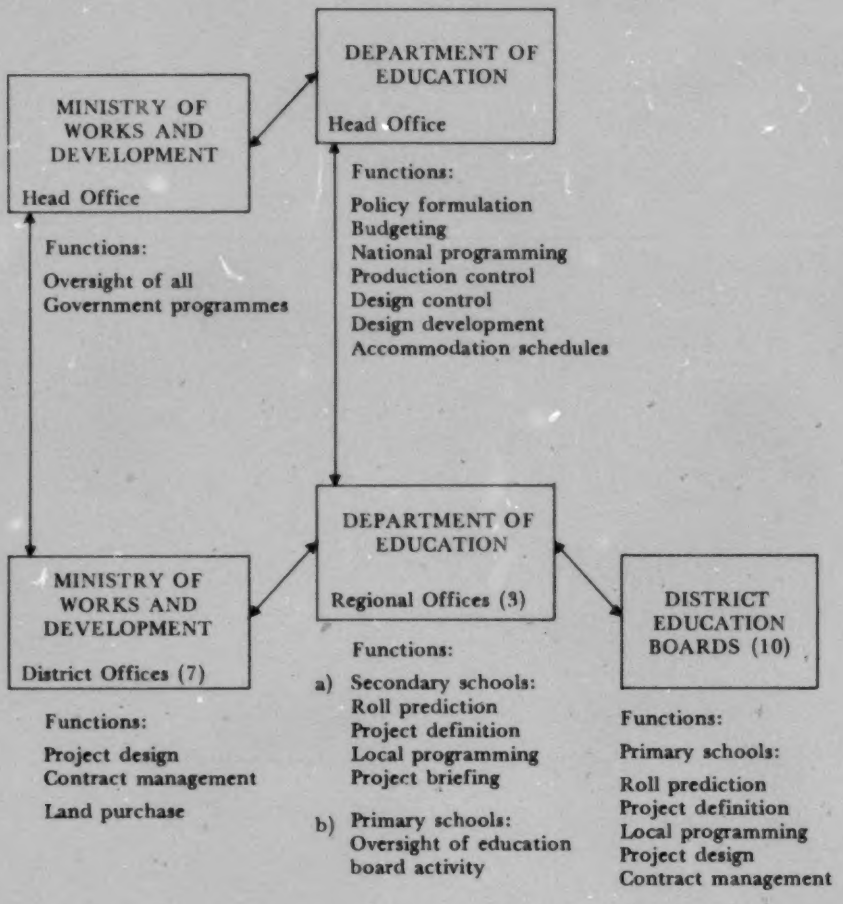
Organization of school building in New Zealand



Bulletin of the Unesco Regional Office
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PAKISTAN

The country, which is contiguous with and topographically similar to parts of Iran, Afghanistan, China and India, faces many of the same constraints to school building. These include the need to design to resist the effects of earthquakes, the problems of building for scattered communities in arid areas of desert and hills, the difficulties of providing facilities in mountainous areas where people live at elevations in the region of 3,000 metres and more and, in many places, a very limited variety of materials suitable for building. There are, of course, lush plain areas such as the Punjab but they are by no means characteristic of the country as a whole.

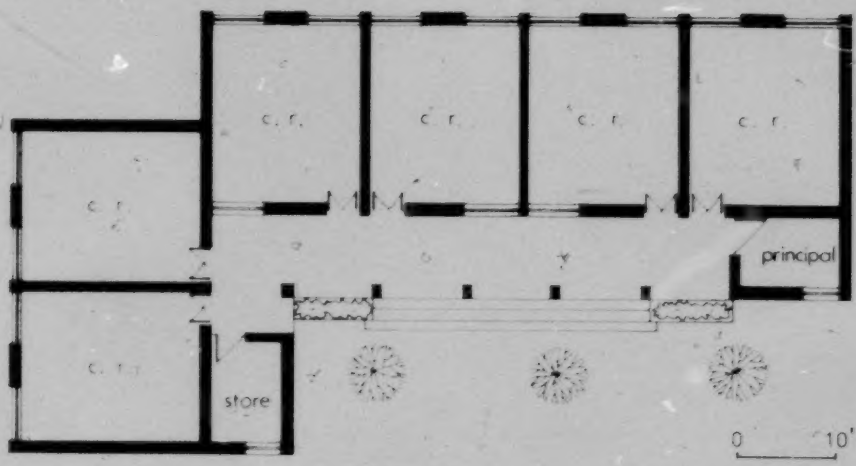
Pakistan, somewhat like Australia and India, is divided for purposes of education into Provinces and other areas, some of which are Federally administered. Educational policy is determined by the Federal Government and in the Provinces, implemented by the Provincial Ministers of Education through the Provincial Education Departments.

Differences in climate and local materials have led, over the years, to the development of a local school architecture in the various provinces. In the hilly regions of the Northwest Frontier Province, for example, buildings are of stone, while in the Punjab they are usually of brick. The two examples of schools in the pages that follow are in the new Federal Capital of Islamabad. Because of the location at the foot of the hills, both brick and stone are freely available and have been used, sometimes in conjunction with concrete frames, in the capital's new buildings.

A very important change that is about to take place in schools in Pakistan is the introduction of agro-technical education. One effect of this change will be the conversion of existing buildings to provide workshop and home science facilities for the new subjects which are being introduced progressively into more than 7,000 schools, from 1976 onward.

PAKISTAN

1. Primary school

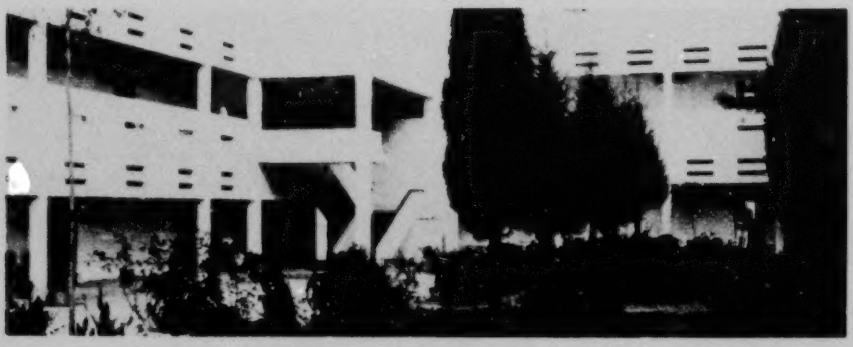


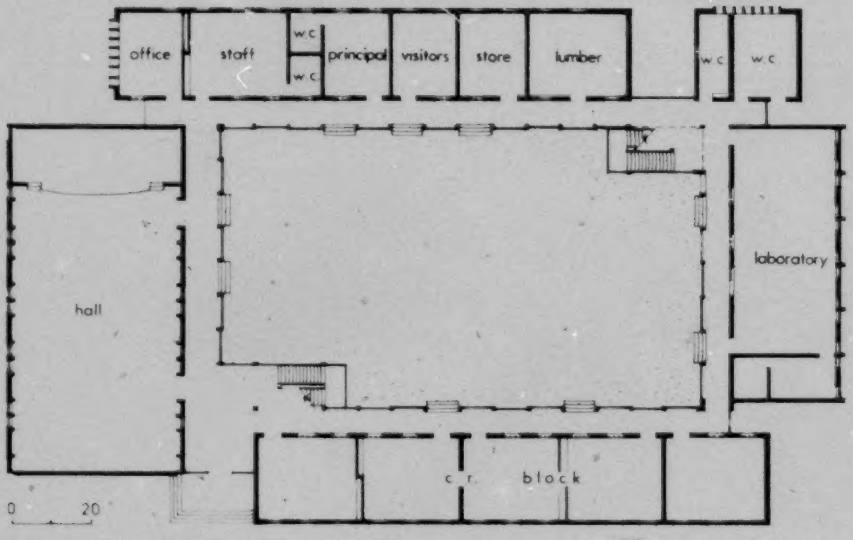
DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	240	Construction completed in 1975	
Built-covered area	305 m2 (1005 sf)	Cost of building US $16,660	
Net area of teaching spaces	154 m2 (1,673.66 sf)		
Area of administration spaces	15 m2 (161.37 sf)	Building cost per student-place	US $ 69.42
Circulation area	42 m2 (120.00 sf)		
Area per student-place	0.80 m2		

Construction: load-bearing brick walls, reinforced concrete roof slab.

PAKISTAN **2. Secondary school**





DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	450	Construction completed early 1970s	
Nett area (all floors)	2 474 m2 (100%)	Cost of land	US $ 36,000
Nett area of teaching spaces	1 061 m2 (42,89%)	Cost of building	US $151,000
Nett area of administration spaces	238 m2 (9,62%)	Cost of external work	US $ 31,000
Circulation area	732 m2 (29,59%)	Building cost per student-place	US $ 355,55
Area of assembly hall	324 m2 (13,10%)		
Area of toilets	119 m2 (4,81%)		
Area per student-place	5,5 m2		

Construction: reinforced concrete frame and flat roof; brick panel walls.

Number of schools by stage of education

Type of school \ Type of area	Urban	Rural	Total
Primary	6 818	51 263	58 081
Lower-secondary	1 388	10 340	11 728
Upper-secondary	2 203	3 947	6 150

All schools are government-owned.

Number of teaching spaces in schools

Type of space \ Stage and type of area	Primary		Secondary	
	Urban	Rural	Urban	Rural
Classrooms	13 492	12 698	130 288	119 264
Laboratories			3 013	14 338
Libraries			2 071	9 693
Assembly halls/gymnasia			15	34

Shortage of facilities

Stage and type of area \ Type of facility		Classrooms	Laboratories	Workshops	Home economics rooms	Arts and crafts rooms	Libraries
Primary	Urban	5 201					
	Rural	26 149					
Secondary	Urban	1 963	1 303	1 202	40	1 240	10
	Rural	469	554	402	67	435	400

Number of pupils by sex and stage of education

Sex \ Stage of education	Primary	Lower-secondary	Upper-secondary
Boys	3 228 376	812 762	333 639
Girls	1 214 403	194 991	74 918

Enrolment by grade and sex

Grade \ Sex	Boys	Girls	Total
I	992 704	436 240	1 428 944
II	712 879	259 226	972 105
III	593 359	213 704	807 063
IV	514 369	174 079	688 448
V	415 065	131 154	546 219
VI	300 906	79 311	380 217
VII	280 977	67 239	348 216
VIII	230 879	48 441	279 320
IX	180 236	40 593	220 829
X	153 403	34 325	187 728

Index of retention by grade

Stage of education and grade	Primary					Lower-secondary			Upper-secondary	
	I	II	III	IV	V	VI	VII	VIII	IX	X
Index	100	69	84	88	86	100	87	86	100	95

Average size of class by type of subject, stage of education and area

Subject matter \ Stage and type of area	Primary		Lower-secondary		Upper-secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
General subjects	43	37	32	20	40	37
Sciences	–	–	33	20	40	25
Practical subjects	–	–	–	–	20	18
Schools	190	61	76	78	415	165

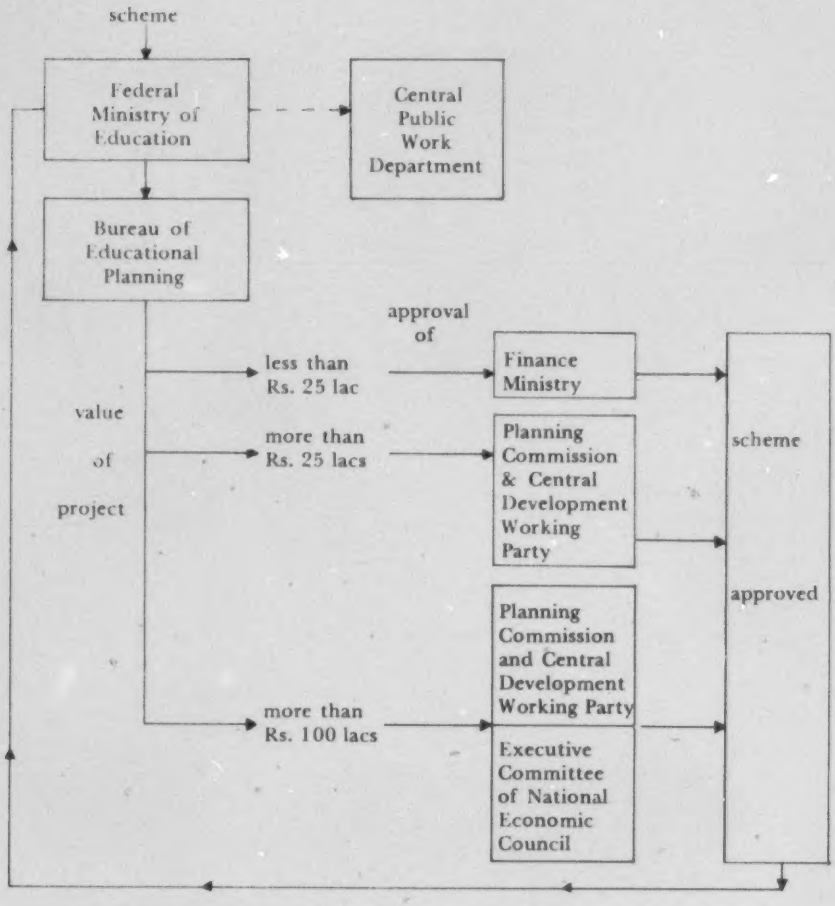
Standards for space allotments in schools in square metres

Type of teaching space \ Stage of education	Primary	Lower-secondary	Upper-secondary
Classrooms	27.7	45	45
Laboratories	–	70	70
Workshops	–	–	70
Home economics rooms	–	–	70
Special rooms	–	–	70
Staff rooms	27.9	–	70

Areas prescribed for sites

Sites	Area		
	Primary	Lower-secondary	Upper-secondary
Rural schools	0.41 ha	0.81 ha	1.2 ha
Urban schools	0.28 ha	0.56 ha	0.9 ha

EDUCATIONAL BUILDING PROCEDURE AT THE FEDERAL GOVERNMENT LEVEL


scheme
Federal Ministry of Education
Central Public Work Department
Bureau of Educational Planning
value of project
approval of
less than Rs. 25 lac
Finance Ministry
more than Rs. 25 lacs
Planning Commission & Central Development Working Party
more than Rs. 100 lacs
Planning Commission and Central Development Working Party
Executive Committee of National Economic Council
scheme approved

1 lac = 100,000

Rs. = Pakistan Rupees

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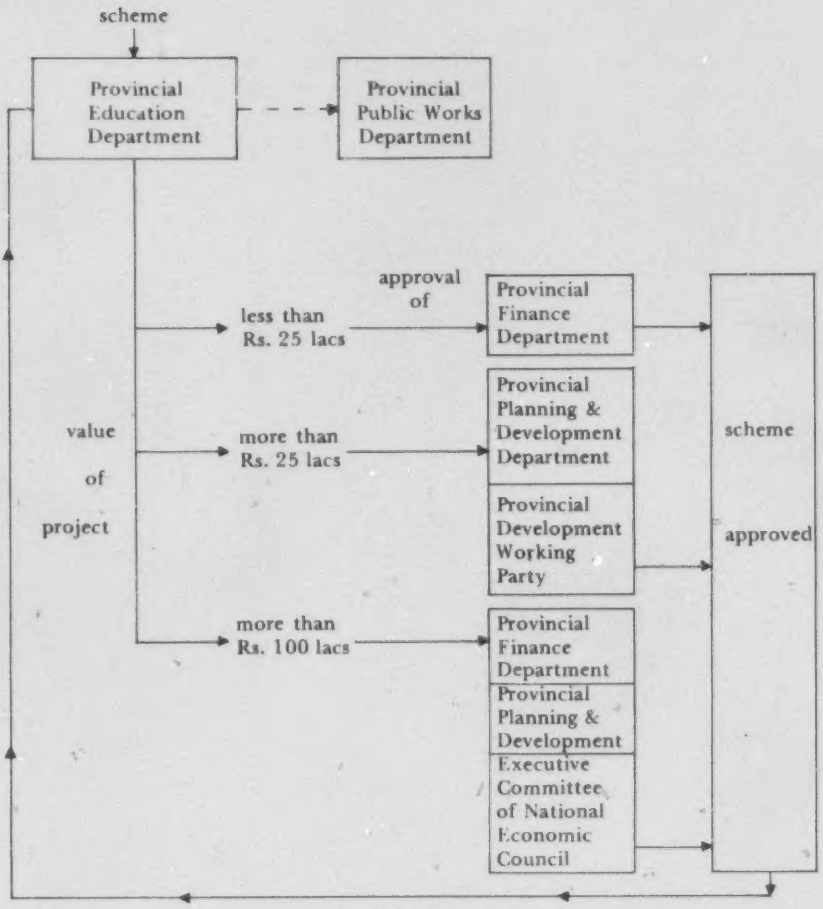
EDUCATIONAL BUILDING PROCEDURE IN THE PROVINCES



1 lac = 100,000

Rs. = Pakistan Rupees

Bulletin of the Unesco Regional Office
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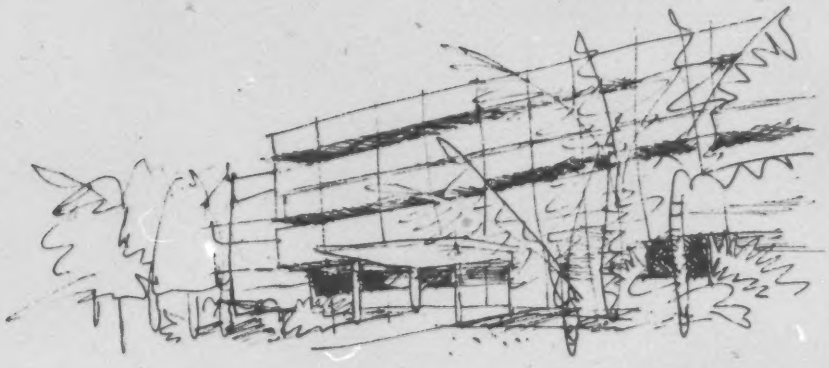
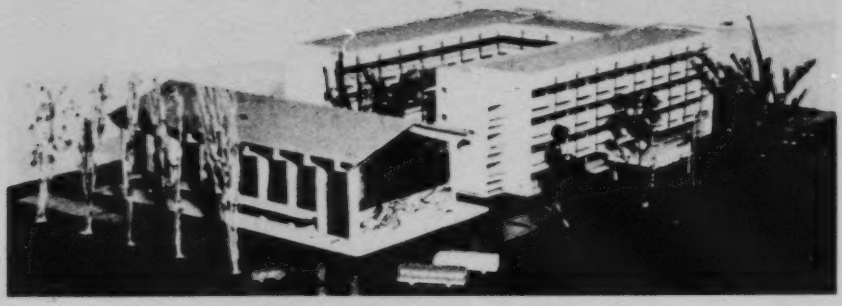
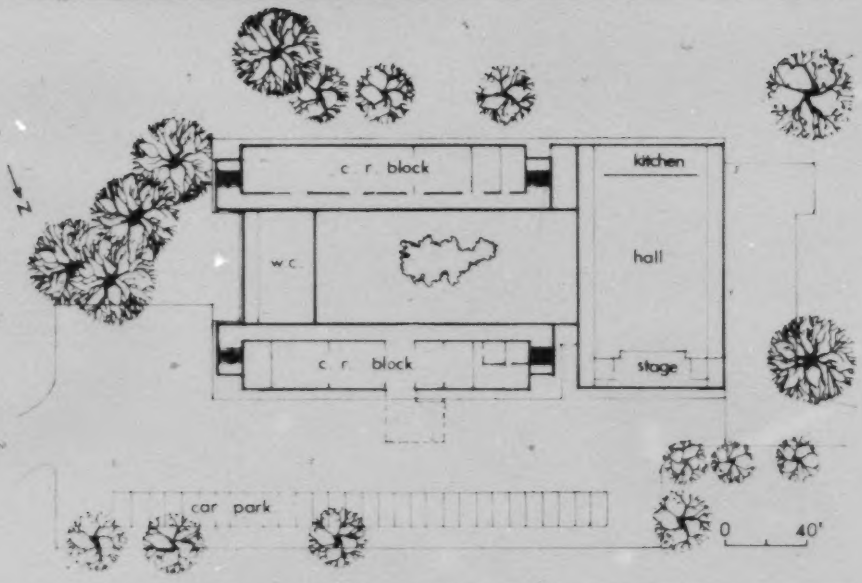
SINGAPORE

Singapore is a small island and sufficiently densely populated to be described as a city state. As a result of the high priority assigned to education by the Government since 1959, a stage was reached some years ago where a place was available for every child of primary school age and enrolment in secondary education had reached a very high level. Current programmes of building are to locate schools in relation to the populations affected by urban renewal programmes.

The construction and building materials industries in the country are well developed and the schools programme is the work of a professionally well-staffed Public Works Department.



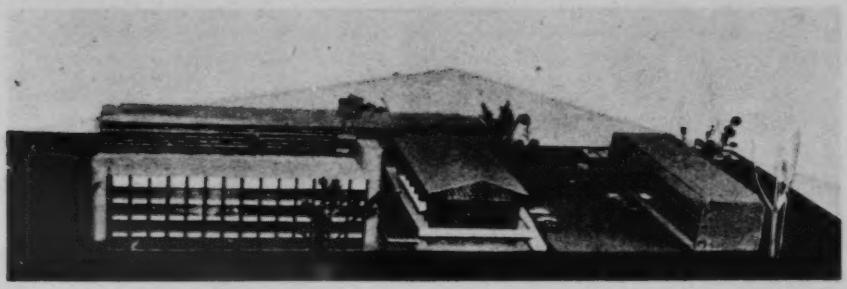


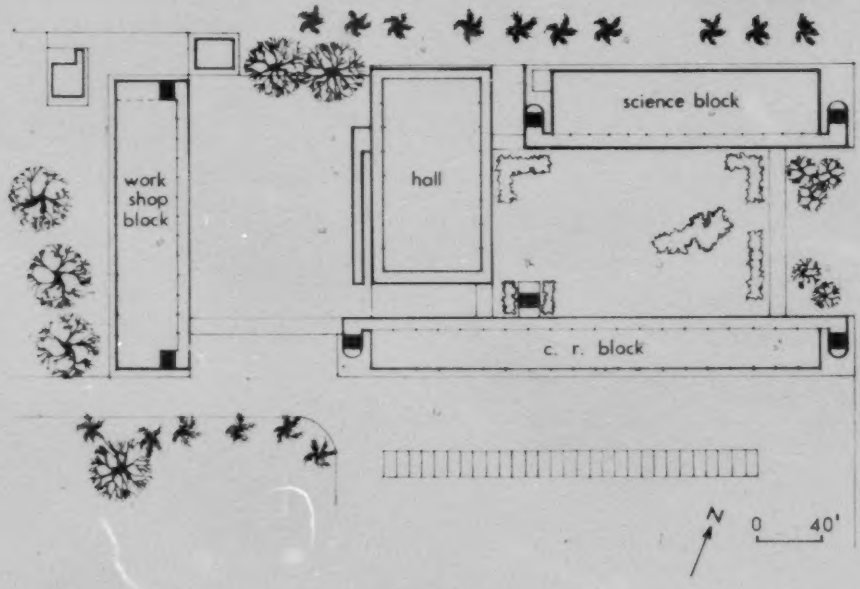


DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	2 240	Construction completed in 1975	
Nett covered area (all floors)	17 620 m2 (100%)	Cost of land	US $152,500
Nett area of teaching spaces	9 640 m2 (54.71%)	Cost of building	US $397,200
Nett area of administration spaces	260 m2 (1.48%)	Cost of external works including services	US $272,000
Area of toilets	440 m2 (2.50%)	Building cost per student-place	US $ 177.32
Circulation area	7 280 m2 (41.32%)		
Area per student-place	7.87 m2		

Construction: superstructure reinforced concrete; partitions plastered brickwork; floors cement; windows glass-louvred; roof corrugated asbestos.





DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 2 240	Construction completed in 1975	
Nett area (all floors)	: 38 680 m2 (100%)	Cost of land	US $747,200
Nett area of teaching spaces	: 16 070 m2 (41.55%)	Cost of building	US $960,500
Nett area of administration spaces	: 1 000 m2 (2.58%)	Cost of external works including services	US $460,000
Area of toilets	: 700 m2 (1.81%)		
Circulation area	: 20 910 m2 (54.06%)	Building cost per student-place	US $ 428.79
Area per student-place	: 17.27 m2		

Construction: superstructure reinforced concrete; partitions plastered brickwork; floors cement; windows glass-louvred; roof corrugated asbestos.

Number of schools by stage of education

Stage of education \ Type of area	Urban	Total
Primary	368	368
Secondary	95	95
Full * (Primary and Secondary)	28	28

* A 'full' school comprises primary and secondary school components.

Ownership of schools

Government or private	Urban	Total
Government-owned	483	483
Privately-owned	8	8

Number of teaching spaces in schools

Type of space \ Stage of education	Primary	Secondary	Full *
Classrooms	5 500	2 588	706
Laboratories	–	431	42
Workshops	–	263	15
Libraries	190	114	21
Assembly halls	10	78	12

* See footnote to table above

Number of schools according to buildings and sex

Type of school \ Stage of education	Primary	Secondary	Full *
Schools in permanent buildings	368	95	28
Co-educational schools	323	79	13
Boys' schools	20	3	3
Girls' schools	25	13	12
Operating in 1 session (shift)	58	14	2
Operating in 2 session (shifts)	310	81	26

* See footnote to first table.

Enrolment by level of education and by sex

Sex \ Stage of education	Primary	Secondary	Pre-university
Boys	178 400	79 700	7 000
Girls	159 300	79 900	7 600

Enrolment by grade and sex

Grade	Sex	Boys	Girls	Total
Primary	I	24 300	23 100	47 400
	II	26 200	24 700	50 900
	III	28 000	26 000	54 000
	IV	29 800	27 300	57 100
	V	29 700	26 800	56 500
	VI	40 400	31 400	71 800
Secondary	VII	20 200	20 300	40 500
	VIII	23 900	22 700	46 600
	IX	18 300	18 700	37 000
	X	17 300	18 200	35 500
Pre-university	XI	3 200	3 700	6 900
	XII	3 800	3 900	7 700

Index of retention by grade

Primary						Secondary				Pre-university	
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
100	100	100	98.6	97.0	94.6	100	100	100	91.6	100	96.0

Average size of class by type of subjects and stage of education

Subject matter \ Stage of education	Primary	Lower-secondary	Upper-secondary
General subjects	37.8	39.6	36.5
Science subjects	37.8	39.6	36.5
Practical subjects	–	20.0	20.0

Average size of school according to stage of education and type of area

Type of area \ Stage of education	Primary	Secondary	Full
Urban	870	1 630	1 400

Capital expenditure in thousands of US dollars

Type of building	Five-Year Plan					
	Primary schools			Secondary schools		
	No. of units	Places	Expenditure	No. of units	Places	Expenditure
New schools [1]	36	78 080	29 015	30	65 920	51 887
Classrooms [2]	976	78 080	9 709	824	65 920	7 574
Laboratories [3]	–	–	–	150	6 000	10 282
Workshops [4]	–	–	–	150	6 000	5 982
Libraries	36	–	Included in 2	30	1 200	Included in 2
Toilets [5]	1 344	–	1 383	720	–	Included in 2, 3, 4
Hall-cum-canteen	36	–	2 648	30	–	4 565

1. New schools: Primary schools – 8 will be built on the 1965 design and 28 on the 1974 design; Secondary schools – 4 will be built on the 1965 design and 26 on the 1974 design.

2. Classrooms include special rooms such as library, principal's office, general office, steff room, sick bay/dental clinic.

3. Includes home economics, audio-visual aid rooms and special rooms.

4. Workshops include metal workshops, woodwork shops, electricity/electronics shops and technical drawing rooms.

5. Number of units defined as number of water closets.

Note: a) Capital expenditure on new schools is computed as the total cost of building the schools (i.e. costs of buildings, external works, services and ancillary charges).

b) Capital expenditure on the sub-items (classrooms, science laboratories, etc.) is computed from cost of buildings only.

c) Thus the total costs on the sub-items do not add up to the capital expenditure on new schools.

Expenditure on land and furniture in US dollars

Stage of education	Land	Furniture			
	(122.2 hectares [1])	Classroom	Laboratory	Workshop	Home economics
36 primary schools	13 142 100 [2]	763 600	–	–	–
30 secondary schools		644 700	115 900	237 100	81 000

1. A new primary school has an area of 1.42 hectares and a new secondary school 3.04 hectares. Usually, schools are built in combinations (e.g. 1 primary and 1 secondary school) with certain shared facilities to economise the use of land.

2. Expenditure on land is solely on cost of acquisition of land.

Sources of funding

Funded entirely by the Government.

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Gross area per student (in square metres)

Primary	Secondary
7.9	17.3

Area per place in educational areas* (in square metres)

Type of area \ Stage of education	Primary	Lower-secondary	Upper-secondary
Classrooms	1.6	1.6	1.6
Laboratories	–	3.4	3.4
Workshops Metal	–	12.2	12.2
Woodwork	–	9.4	9.4
Electricity/electronics	–	4.4	4.4
Home economics	–	4.0	4.0
Special rooms	1.6	1.6	1.6
Others – Technical drawing room	–	4.0	4.0
Art and crafts room	–	3.9	3.9

* Assumed 40 pupils per location; in actual situation, number of students is less than 40.

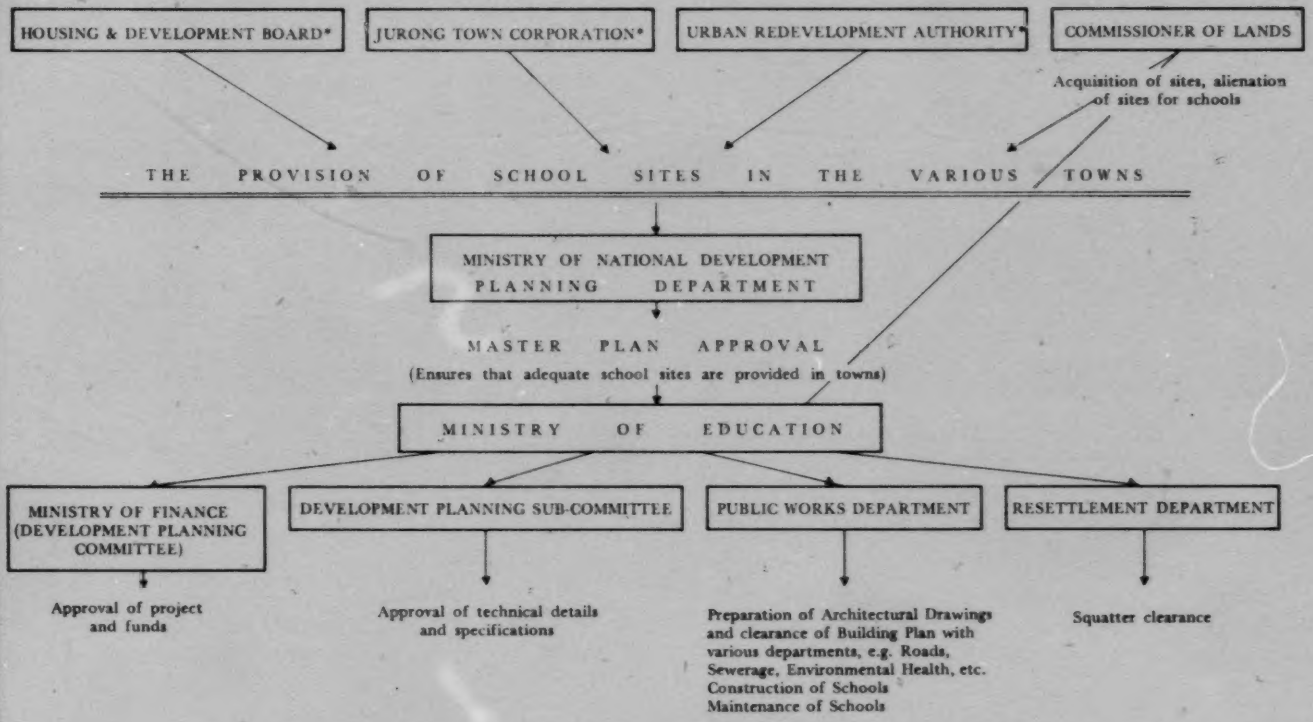
Regulated area of land per school

Regulated area	Primary	Secondary
Per school in hectares	1.42 ha	3.03 ha
Per place for playgrounds/sports	3.3 m2	4.8 m2

Scale of toilet facilities

Stage of education and sex		Number of units per school		
		Closets	Urinals	Wash basins
Primary	Boys	16	18 m	16
	Girls	32	–	16
Secondary	Boys	31	34 m	40
	Girls	41	–	40

ORGANIZATION FOR SCHOOL BUILDING IN SINGAPORE


HOUSING & DEVELOPMENT BOARD*
JURONG TOWN CORPORATION*
URBAN REDEVELOPMENT AUTHORITY*
COMMISSIONER OF LANDS
Acquisition of sites, alienation of sites for schools
THE PROVISION OF SCHOOL SITES IN THE VARIOUS TOWNS
MINISTRY OF NATIONAL DEVELOPMENT
PLANNING DEPARTMENT
MASTER PLAN APPROVAL
(Ensures that adequate school sites are provided in towns)
MINISTRY OF EDUCATION
MINISTRY OF FINANCE (DEVELOPMENT PLANNING COMMITTEE)
DEVELOPMENT PLANNING SUB-COMMITTEE
PUBLIC WORKS DEPARTMENT
RESETTLEMENT DEPARTMENT
Approval of project and funds
Approval of technical details and specifications
Preparation of Architectural Drawings and clearance of Building Plan with various departments, e.g. Roads, Sewerage, Environmental Health, etc.
Construction of Schools
Maintenance of Schools
Squatter clearance

* Statutory Boards

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

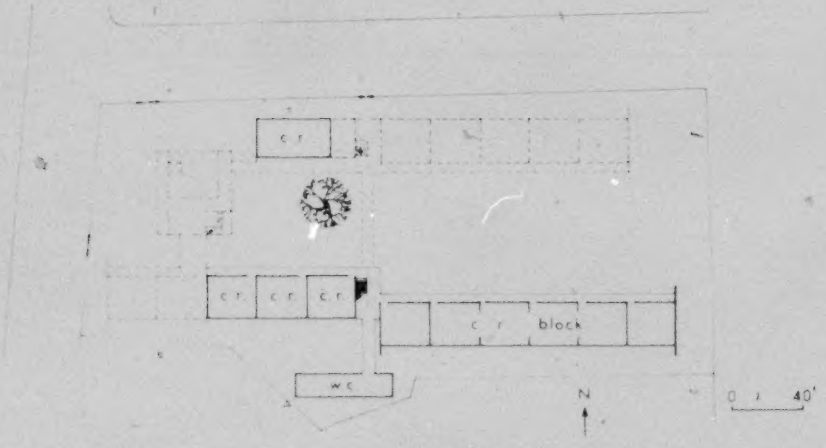
SRI LANKA

Although Sri Lanka is one of the countries of the region having already achieved universal primary education, recent reforms of the educational system introducing a substantially increased proportion of work-oriented activity in the curriculum have created a need for more specialized types of accommodation. With its own School Works Branch in the Education Ministry, it has been possible—through the use of standard designs and decentralized arrangements for construction—to provide much of the accommodation needed in a short time.

Sri Lanka is mountainous in its central regions. However, it is usually possible to find land for building. The main constraint is the need to reduce to a minimum the use of construction materials that have to be imported. In consequence, most buildings are built of locally available brick, cement, tiles and timber.

The hall type of building is the most typical accommodation provided for education in Sri Lanka—it is used for almost all rural primary schools as well as for many of the country's secondary schools. Although other countries such as Bangladesh and Burma have schools without internal walls, the Sri Lanka open-hall school is unique in design. The long undivided hall, in which are accommodated as many classes as can be conveniently seated, provides a degree of flexibility not found in classrooms with rigid, permanent, dividing walls. Small and large groups of students can be accommodated simply by adjusting the furniture.

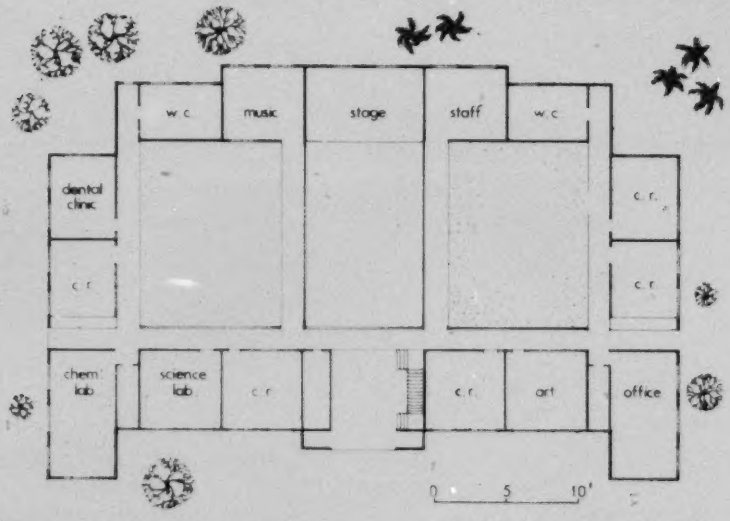
Moreover, open at both sides, the open-hall school suits the climate of Sri Lanka. The building is not only economical to construct but is particularly suitable for rural schools with small enrolment where one teacher may teach several classes. It has been estimated that more than 85 per cent of students receive their education in this type of building.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	1 600		Construction completed in		1976
Nett covered area (all floors)	2 519	m2 (100%)	Cost of land	US $	29,412
Nett area of teaching spaces	1 749	m2 (69.44%)	Cost of building	US $	126,323
Nett area of administration spaces	217	m2 (8.63%)	Cost of external work	US $	91,029
Area of toilets	83.80	m2 (3.33%)	Building cost per student-place	US $	78.95
Circulation area	468.59	m2 (18.60%)			
Area per student-place	1.57	m2			

Construction: reinforced concrete columns and floor slabs; brickwork walls, timber roof, covered with calicut tiles.



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	:	750		
Nett covered area (all floors)	:	4 000	m2	(100%)
Nett area of teaching spaces	:	2 741	m2	(68.52%)
Nett area of administration spaces	:	97	m2	(2.42%)
Area of toilets	:	70	m2	(1.75%)
Circulation area	:	1 092	m2	(27.30%)
Area per student-place	:	5.33	m2	

Construction completed in		1940
Cost of land	US $	29,412
Cost of building	US $	215,846
Cost of external work	US $	32,500
Building cost per student-place	US $	287.79

Construction: reinforced concrete columns and floor slabs; brickwork walls, asbestos and calicut tiles on timber roof.

Number of schools by stage of education and type

Type of school	Number
Primary	3 191
Primary combined with lower-secondary	5 048
Primary combined with lower- and upper-secondary	715
Lower-secondary combined with upper	411
Government-owned	9 321
Privately-owned	44

Number of schools by sex, residence and utilization

Type of school	Number
Residential schools	98
Coeducational schools	8 907
Boys' schools	195
Girls' schools	263
Schools operating in 2 sessions (shifts)	68

Number of pupils by sex and stage of education

Sex \ Stage of education	Primary	Lower-secondary	Upper-secondary
Male	766 035	511 842	35 857
Female	680 762	510 279	41 415

Enrolment by grade and sex

Grade \ Sex	Male	Female	Total
I	192 935	174 393	367 328
II	175 231	156 880	332 111
III	147 372	133 165	280 537
IV	109 619	84 455	194 074
V	140 878	131 869	272 747
VI	113 980	108 690	222 670
VII	100 666	96 361	197 027
VIII	90 833	88 407	179 240
IX	65 515	68 535	134 050
X	140 848	148 286	289 134
XI	16 621	19 600	36 221
XII	19 236	21 815	41 051

Index of retention by grade

Grade	I	II	III	IV	V	VI	VII	VIII	IX
	100	97.81	92.71	82.35	73.16	64.11	56.16	49.40	43.49

Number of schools according to size

Size of school	Number of schools
1–50 students	924
51–100 "	1 496
100–200 "	2 102
201–500 "	2 710
500–1000 "	1 002
1001–2000 "	304
over 2000 "	35

Average size of teaching group by grade

Grade \ Teaching groups	Average size	Lowest district average size	Highest district average size
I	31.7	17.8	38.2
II	27.4	15.3	35.9
III	23.2	14.3	33.5
IV	27.7	14.8	37.2
V	25.0	13.5	36.1
VI	27.5	20.6	35.7
VII	26.7	17.1	34.6
VIII	22.9	14.3	32.5
IX Arts	25.3	15.4	32.6
Science	29.8	18.0	36.0
Commerce	31.0	20.7	34.9
X Arts	26.3	18.7	30.8
Science	30.4	19.0	35.5
Commerce	18.5	17.4	33.9
XI Arts	14.6	7.3	20.8
Science	27.7	8.5	38.2
Commerce	17.6	2.0	28.6
XII Arts	13.7	6.0	19.1
Science	24.3	3.0	30.8
Commerce	17.7	5.0	25.6

Capital expenditure in US dollars

Type of expenditure	No. of units	Places provided	US dollars
New classrooms	816	32 640	210 234
Laboratories and science rooms	318	12 720	284 108
Workshops	14	560	49 354
Libraries	2	100	7 353
Toilets/urinals	617	–	90 735
Agriculture units	21	420	30 103
Social science units	1	40	1 260
Commerce rooms	9	360	29 405
School dental clinics	1	–	7 502
Home science rooms	1	40	5 997
Multi-purpose classrooms	3	270	21 295
Total expenditure			737 346

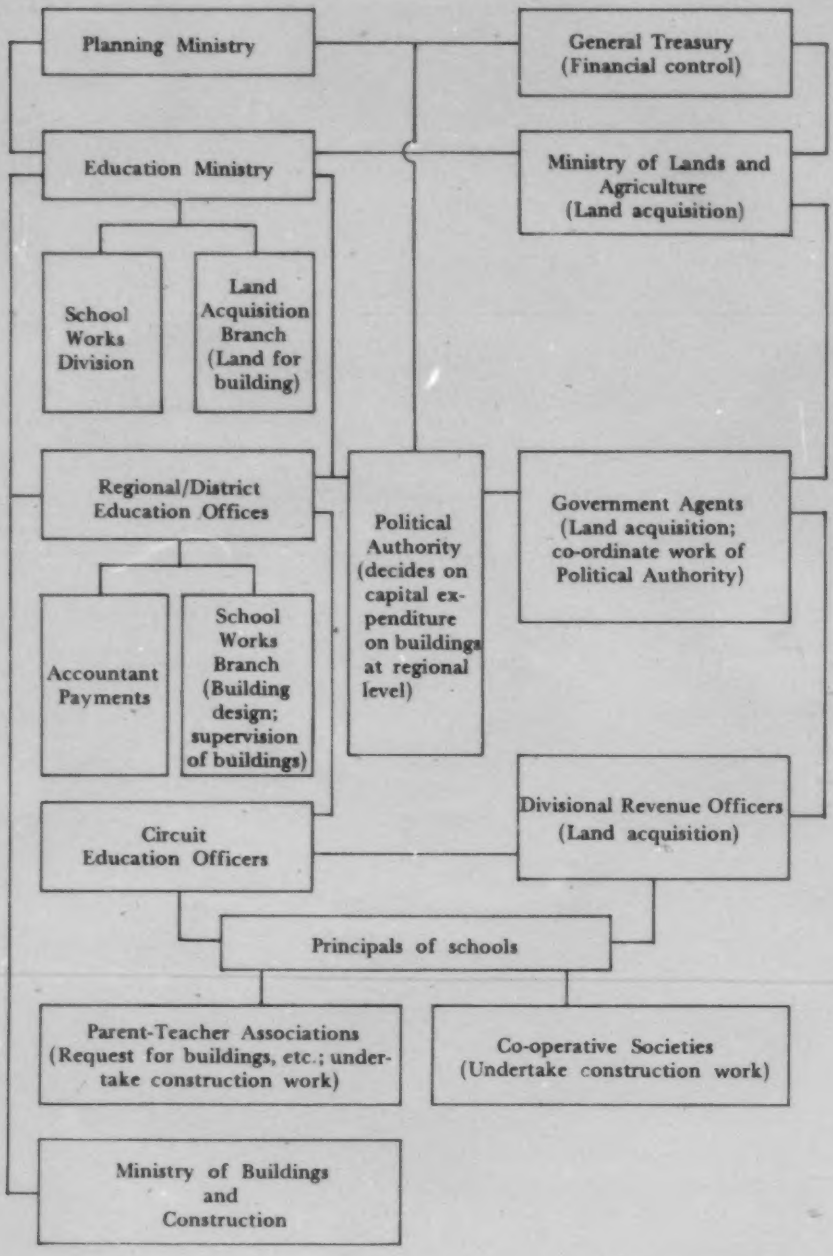
Expenditure in US dollars on furniture and service

Type of expenditure	US dollars
Classroom furniture	571 298
Laboratory furniture	33 452
Workshop furniture	87 585
Other furniture	170 705
Maintenance of buildings	511 034
Maintenance of furniture	42 256
Supply of electricity, water and fuel	90 309
Telephones	18 382
Transport	7 353

Sources of funds by type of expenditure

Type of expenditure / Source of funds	National budget	UNICEF aid	UNFP aid
General administration	4 684 339	–	–
Primary and secondary education	76 631 241	271 849	42 424
Teacher education	1 273 509	9 090	–
Technical/vocational education	942 438	–	–

ORGANIZATION FOR EDUCATIONAL BUILDING IN SRI LANKA


Planning Ministry
General Treasury (Financial control)
Education Ministry
Ministry of Lands and Agriculture (Land acquisition)
School Works Division
Land Acquisition Branch (Land for building)
Regional/District Education Offices
Political Authority (decides on capital expenditure on buildings at regional level)
Government Agents (Land acquisition; co-ordinate work of Political Authority)
Accountant Payments
School Works Branch (Building design; supervision of buildings)
Divisional Revenue Officers (Land acquisition)
Circuit Education Officers
Principals of schools
Parent-Teacher Associations (Request for buildings, etc.; undertake construction work)
Co-operative Societies (Undertake construction work)
Ministry of Buildings and Construction

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

THAILAND

Thailand presents a wide range of technical problems to those faced with designing schools. Although much of the centre of the country is flat, rice-growing land, it is wet and comprises soft clay. Buildings constructed in this area have to be supported on piles and, because of the high water table and frequent flooding, they are usually raised some three or four metres above ground level. Access to many schools is by canal, for there is an extensive network of internal waterways.

Away from the central, rice-growing area, the land is hilly and much of it is covered in dense jungle, thinned in the border areas by the shifting cultivation of some of the hilltribes. In these areas, timber is the natural material for a building process that is made very difficult by the terrain.

Although there are many technical challenges to be met in implementing a school construction programme, Thailand is fortunate in having adequate resources of skilled manpower. The two schools of architecture produce all the architects required by the Ministry of Education; there is an abundance of civil engineers and the many vocational schools produce the technicians used for the extremely efficient construction industry.

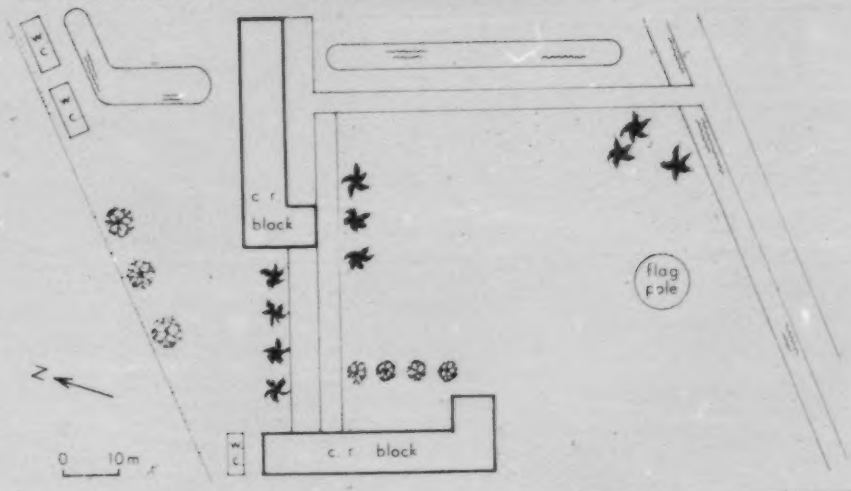
The Ministry of Education is unique in its organization for building, for each of the primary, secondary, vocational and teacher training sections has its own team of architects and other technicians who are thus not only able to specialize in school building but become expert in particular aspects of school design.

Despite this, the total annual investment in construction is such that it is not possible to design individual schools for individual sites and, as is the case in so many other countries of the region, heavy reliance has to be placed on standard building plans. These plans, however, offer a wide variety of choices in respect of school size, and different designs are available for different types of sites.

Somewhat unusually also for the Asian region, much of the furniture in Thai schools is designed by Ministry architects to meet the special needs of the schools.

THAILAND

1. Primary school



DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

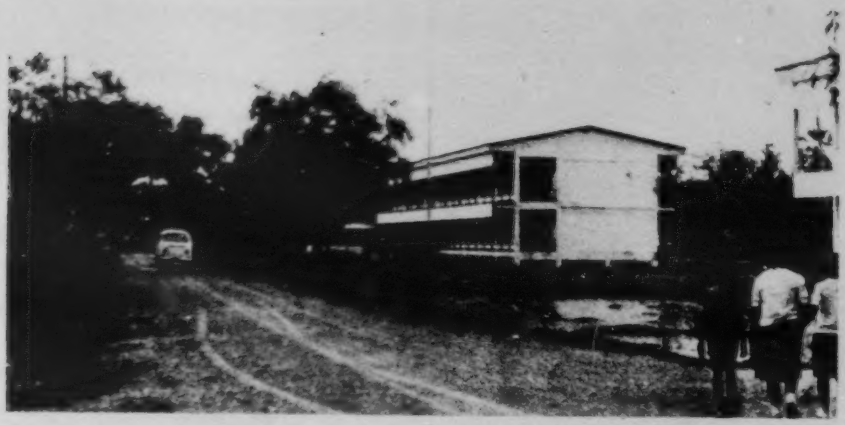
Number of students	:	367	Construction completed in 1964	
Nett area (all floors)	:	1 200 m2 (100%)	Cost of land	US $160,000
Nett area of teaching spaces	:	630 m2 (53%)	Cost of building	US $ 50,000
Area of administration spaces	:	96 m2 (8%)		
Area of toilets	:	60 m2 (5%)	Building cost per student-place	US $ 136.24
Circulation area	:	400 m2 (33%)		
Other area	:	14 m2 (1%)		
Area per student-place	:	3.27 m2		

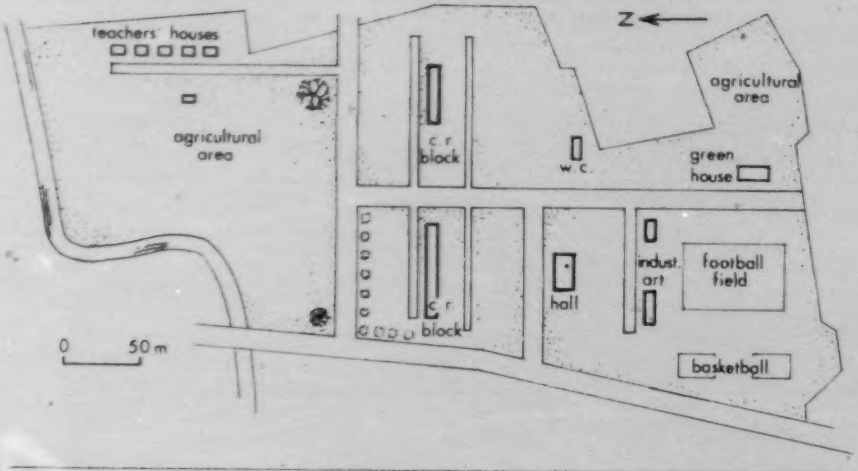
Construction: concrete foundation, timber framed superstructure, asbestos cement roof sheeting.

Note: 1. The cost data have been updated to the 1976 prices.

2. In most cases, the Ministry does not have to purchase land for building schools, since the schools are located within the compound of a temple, or on donated land.

THAILAND **2. Provincial secondary school**





DATA RELATED TO THE SCHOOL ILLUSTRATED ABOVE

Number of students	: 735	Construction completed in 1964	
Nett area (all floors)	: 2 610 m2 (100%)	Cost of land	US $400,000
Nett area of teaching spaces	: 1 228 m2 (47%)	Cost of building	US $106,500
Area of administration spaces	: 126 m2 (4.8%)		
Area of toilets	: 84 m2 (3.2%)	Building cost per student-place	US $ 144.90
Circulation area	: 1 172 m2 (45%)		
Area per student-place	: 3.55 m2		

Construction: reinforced concrete structure, asbestos cement roof sheeting.

Note: 1. The cost data have been updated to the 1976 prices.

2. In most cases, the Ministry does not have to purchase land for building schools, since the schools are located within the compound of a temple, or on donated land.

Number of schools by stage of education and type (academic stream)

Stage of education \ Type of area	Urban	Rural	Total
Primary	800	28 803	29 603
Lower-secondary	21	521	542
Upper-secondary	1	–	1
Primary combined with lower-secondary	236	827	1 063
Primary combined with lower- and upper-secondary	49	38	87
Lower combined with upper-secondary	62	146	208

Number of schools and school conditions

School situation \ Education level and type of area	Primary		Secondary	
	Urban	Rural	Urban	Rural
Schools in permanent buildings	436	28 579	71	627
Schools in temporary buildings	–	–	2	5
Residential schools	3	16	–	1
Coeducational schools	436	28 579	44	606
Boys' schools	–	–	16	10
Girls' schools	–	–	11	11
Schools operating in two sessions (shifts)	3	–	31	17

Ownership of schools

Government or private \ Type of area	Urban	Rural	Total
Government-owned	498	28 847	29 345
Privately-owned	671	1 488	2 159

Shortage of facilities in government-owned schools

Stage and type of area	Number of rooms needed				
	Class-rooms	Laboratories	Workshops	Home economics	Libraries
Secondary urban	35	177	384	94	48
Secondary rural	312	1 072	2 593	510	215

Enrolment by stage of education and type of area (academic stream)

Sex \ Stage	Primary		Lower-secondary		Upper-secondary	
	Urban	Rural	Urban	Rural	Urban	Rural
Male	313 006	3 455 114	90 211	464 473	25 633	48 108
Female	281 621	3 088 050	73 763	320 950	20 755	43 335

Enrolment by grade and type of area

Grade \ Area and sex	Urban		Rural		Total	
	Male	Female	Male	Female	Male	Female
I	62 780	57 131	799 577	733 500	862 357	790 631
II	45 802	42 474	664 706	612 976	710 508	655 450
III	47 518	43 825	652 679	601 085	700 197	644 910
IV	44 694	41 323	561 581	529 595	606 275	570 918
V	41 125	34 963	305 907	246 270	347 032	281 233
VI	37 057	31 915	254 622	198 923	291 679	230 838
VII	34 030	29 990	216 042	165 701	250 072	195 691
VIII	34 493	28 014	173 239	125 313	207 732	153 327
IX	29 744	24 401	149 435	106 770	179 179	131 171
X	25 974	21 348	123 799	88 867	149 773	110 215
XI	15 518	12 092	31 862	27 213	47 380	39 305
XII	10 115	8 663	16 246	16 122	26 361	24 785

Index of retention by grade (100 in 1964)

Primary							Lower-secondary			Upper-secondary	
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
100	82	77	66	21	19	18	16	15	14	5	3

Average size of class and school, by stage of education and area

Stage of education	Average size of class		Average size of school	
	Urban	Rural	Urban	Rural
Primary	36	21	568	198
Lower-secondary	40	38	730	456
Upper-secondary	39	33	3 732	–
Combined lower- and upper-secondary	–	–	1 805	1 439

Capital expenditure in thousands of US dollars

Type of building \ Education level	Primary schools	Secondary schools
New schools	15 978	1 040
Additional classrooms	–	8 142
Workshops	990	1 185
Toilets	392	667
Teachers' and janitors' houses	–	2 993

Expenditure on furniture and equipment in thousands of US dollars

Stage of education	Classroom
Primary	2 371
Secondary	1 587

Expenditure on maintenance in thousands of US dollars

Subject of expenditure \ Education level	Primary schools	Secondary schools
Buildings	2 590	342

Sources of funds and amount realized in thousands of US dollars

Stage of education \ Source	National budget	Foreign aid
Primary schools	183 228	–
Secondary schools	63 159	3 354

Areas in teaching spaces in typical schools (in sq. metres)

Type of space \ Level of education and area	Primary		Secondary	
	Urban	Rural	Urban	Rural
Classrooms	63	63	64	64
Laboratories	81	63	96	96
Workshops	192.5	192.5	105–210	105–210
Libraries	63–126	63–126	96–195	96–195
Assembly halls/gymnasia	122.5	122.5	756–800	756–800

Areas prescribed for spaces in buildings, per place (in sq. metres)

Type of spaces \ Stage of education	Primary	Lower-secondary	Upper-secondary
Classrooms	1.5	1.5	1.5
Laboratories	1.7	2.2	2.2
Workshops	2.2	3.8	3.8
Home economics rooms	2.2	3.2	3.2
Special rooms	1.5	1.5	1.5
Gross area per place	2.81	3.47	3.47

Areas prescribed for sites

Type of area	Primary	Lower-secondary	Upper-secondary
Per rural school (in hectares)	1.6	5.6	5.6
Per urban school (in hectares)	0.8	3.2	3.2
Playgrounds, per place (in sq. metres)	1.9	2.7	2.7
School gardens, per place (in sq. metres)	0.8	1.5	1.5
Sports, per place (in sq. metres)	3.4	5.0	5.0

Toilet accommodation is provided on the basis of 1 closet per 45 students and 1 wash basin per 90 students

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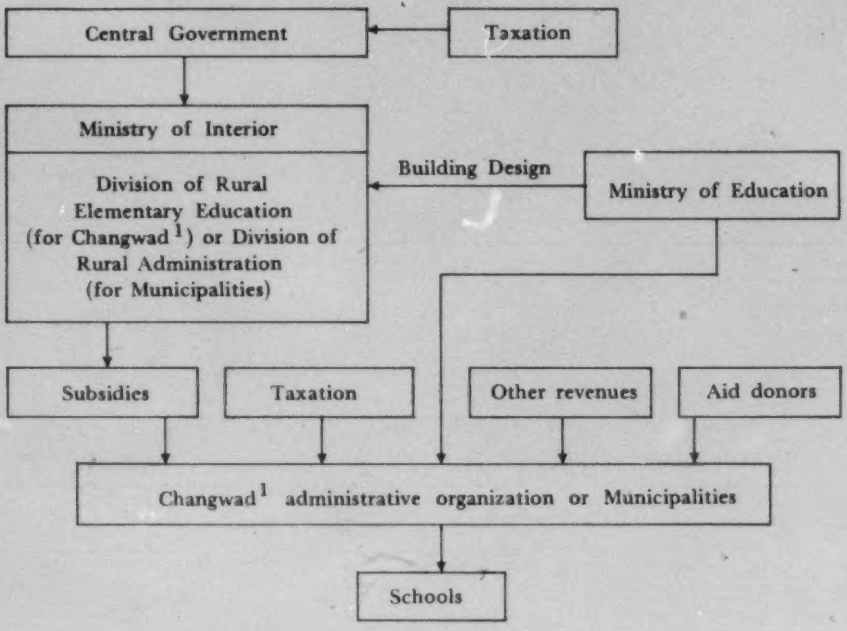
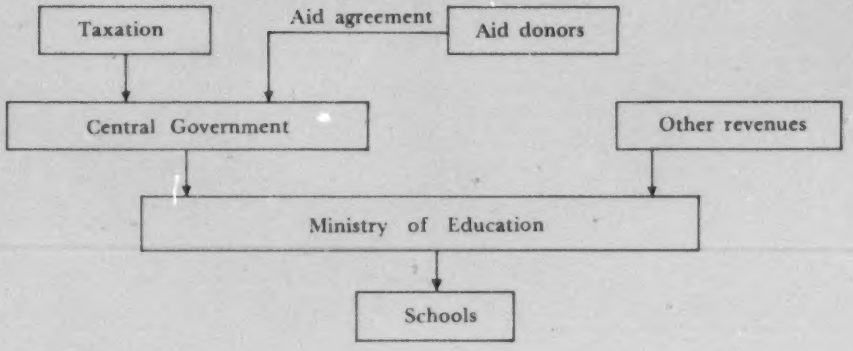
ORGANIZATION FOR SCHOOL BUILDING IN THAILAND

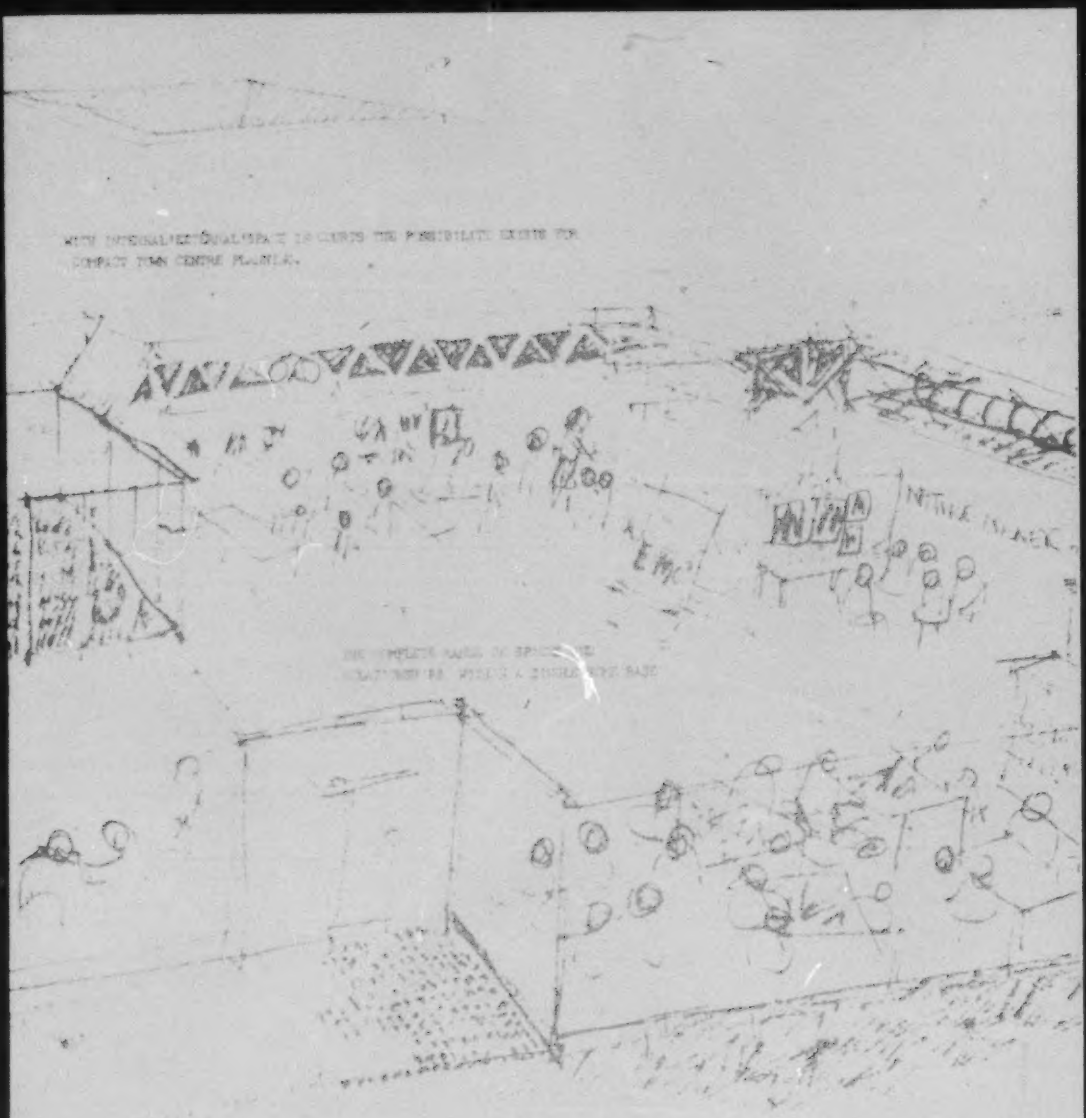
Primary school building



Secondary school building



1 "Changwad" is a province or a town.



SECTION THREE

ASPECTS OF EDUCATIONAL BUILDING IN THE ASIAN REGION

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

LABOUR-INTENSIVE PREFABRICATED SCHOOLS FOR RURAL ASIA

by Dinesh Mohan and R.D. Srivastava

A phenomenal increase in school-going population in developing countries has resulted in a requirement for large numbers of school buildings. The heavy backlog of school buildings, coupled with an ever-increasing demand, makes it imperative that these facilities be speedily provided. (Plate 1) The emergence of new economic and social needs and the pressure of competing claims on limited resources for developmental activities are a common feature of almost all Asian countries. This calls for an approach to school building construction in which the available resources are utilized to the maximum possible extent. Prefabrication and system building have been identified as techniques which have fulfilled similar requirements in some developed countries. These techniques need sophisticated machinery, equipment and skilled labour, however, and are not suited to developing countries—although the existing traditional systems of construction are also unable to meet the requirement for large-scale construction programmes. Hence an appropriate technology is necessary.

Plate 1. Many countries have a heavy backlog of school building construction. In Uttar Pradesh in India, vigorous efforts are being made to construct new buildings for schools such as this.

The school building problem in Asia is most acute in the rural areas, where the great majority of the population lives. The rural societies have their own socio-economic, cultural and technical constraints. The experiences of the authors have led them to believe that these very constraints can be converted into resources and that suitable building techniques which meet the aspirations of the people can be evolved. This, however, requires a thoughtful analysis and proper understanding of the existing state of knowledge and resource availability.

Constraints to building in developing societies

Most Asian countries are short of certain building materials like cement and steel. Even if they are available (in relatively small quantities) other construction works such as dams, bridges and factories are often thought to have a more legitimate claim on them than school buildings. On the other hand, natural building materials are available in plenty in most rural areas. Obviously, the use of such materials is desirable because they are economical and, most important of all, blend harmoniously with the natural environment. Unfortunately, however, these materials sometimes suffer from certain major drawbacks. They are quickly attacked by fungus, white ants, sun, rain and other weathering effects. (Plate 2) This results in heavy maintenance costs and/or periodic replacement of structural members.

Experience has shown that school buildings constructed with local materials need special attention and care for their upkeep. The lack of interest and apathy of the community in the maintenance of such buildings

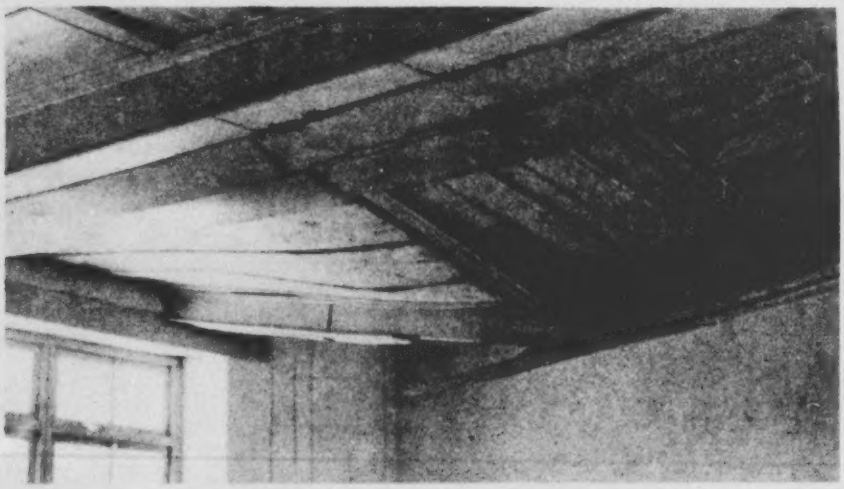


Plate 2. Many local materials suffer from drawbacks such as ease of attack by termites or rapid damage by weather, as is shown by this collapsing ceiling.

is well known. On the other hand, the lack of adequate funds and cumbersome bureaucratic procedures often lead to situations where even the governments do not properly maintain school buildings. This leads to unhappy consequences, and results in a national loss in the form of school buildings which do not last long.

Building traditions in most developing countries date from the time when populations were small, and good, locally available building materials were both relatively cheap and easy to obtain. This tradition, even today, relies heavily upon such factors as deep foundations, thick walls and high ceilings. (Plate 3) Similarly, the modern concept of optimum space utilization did not find much scope in traditional building design.

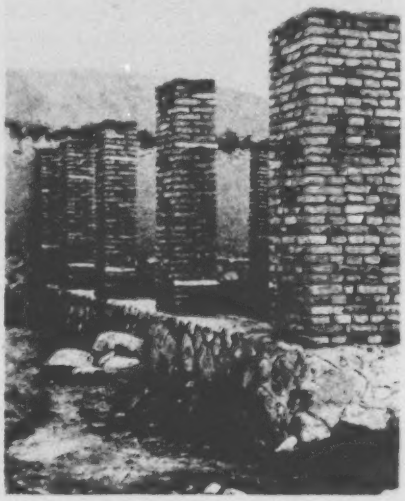


Plate 3. The excessively thick walls and heavy foundations of traditional construction not only take time to construct but also often consume all the money available before the school building is finished.

Management

Developing countries can also be characterized by a serious lack of middle-level executives, technicians and skilled workers. The stock of technicians and skilled workers available in these countries tends to migrate to the towns due to the lack of opportunities in the rural areas. There is general dependence on government for jobs, and a lack of initiative in respect of self-employment. This has further resulted in large-scale unemployment among qualified technical personnel. On the other hand, there is an important reservoir of unqualified and unskilled manpower in each country which could profitably be utilized for building activities, provided a little attention be given in their training. Rural school construction does not need highly sophisticated technical innovations, nor can such an approach be afforded because of its nature and quantum. The architects in the developing world have therefore to understand these problems and to serve more as *social-worker architects* rather than as *designers for the elite.*

In many countries of Asia, the building industry has not been able to organize itself on a firm footing. Wherever it has been able to do so, it is mainly urban-oriented and unable to meet the requirements of rural areas. The procedures, organizations and technologies are designed to cater for

urban needs and their application in rural situations has not been successful. Construction work in rural areas generally involves a small financial outlay in which no formally designated contractor of standing is likely to be interested; hence such work is undertaken by the local craft entrepreneurs. Such men are generally neither in a position to afford the overhead cost of the procedural requirements for standard contracts, nor to wait long for payment. Experience has shown that the procedural and managerial aspects of construction, especially in rural areas, have been a big obstacle to achievement of the objectives and goals set for the construction of schools in rural Asia. The normal government rules and procedures are time-consuming, especially those relating to finance and administration. Procedures or rules rarely exist designed to administer projects with limited funds and where time targets have to be achieved. Government building projects are, by rule, required to be undertaken by contractors on the basis of competitive tendering—which consumes time and may result in false economy, as low bidders often use cheap materials, take shortcuts and are generally inefficient.

From the above it can be concluded that:

1. There is general scarcity of financial resources, and that projects, of necessity, must now use methods directed by the demands of absolute economy. This calls for the introduction of an approach where a major portion of the construction cost is controlled and the budget pre-defined, so that as many schools as possible are provided with reasonable workmanship.
2. The traditional methods of design and construction call for a change, in order to improve capacity and speed up the erection of buildings. The building process must therefore use pre-determined standards of quality and mass production techniques. Standardization will be the starting point in these factors.
3. A system of durable and maintenance-free skeleton structures should be developed. In non-structural building elements, use should be made of local materials which can be easily replaced as and when required, catering to the requirement of flexibility and community participation in the construction activity.
4. A large number of unemployed skilled workers should be meaningfully engaged in the production of standardized components. This process can be greatly simplified by the development of simple technology which need not be dependent on machinery, equipment and large financial outlay. While developing such building elements, special note has also to be taken of the fact that the end product has to be erected by unskilled labour and that the building elements have to be delivered to village sites by available modes of transport which may be by animal-drawn carts, boats or even manual transportation. (Plate 4)

Plate 4. Building elements have to be designed for transport to the rural areas by whatever means is available—often, as in this case, by bullock cart.

All this obviously suggests the need for some sort of partial prefabrication to replace those elements which, in the traditional types of construction, are time-consuming to manufacture and erect. The roof is the most critical and expensive of all elements of a building and, once the roofing problem is solved, the structure can acquire a permanent character with relatively small maintenance. Designs and systems devised for roofing will be highly valuable if they are such that manufacture is by unskilled labour, which is available in plenty. It is only then that the whole process becomes labour-intensive. (Plate 5)

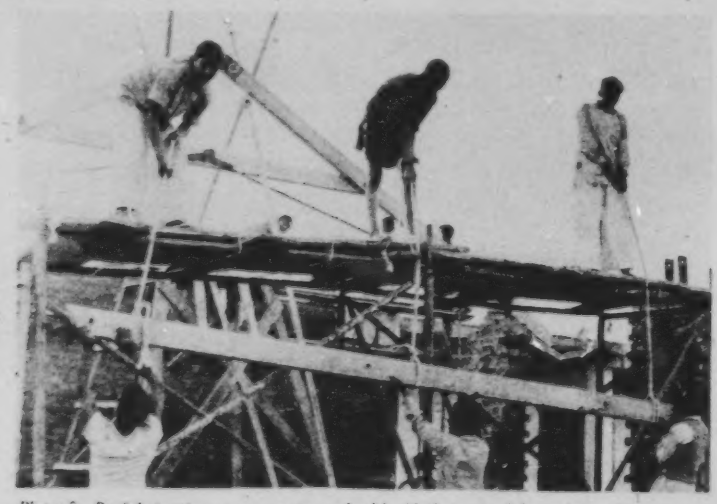


Plate 5. Prefabrication systems are valuable if they are labour-intensive.

The problem of evolving systems, as conceived above, is neither the end of the process, nor is it any guarantee of either low-cost or rapid construction, for the problem of school buildings is not entirely technical. Simplified and rational management is an equally important consideration. There is great resistance by people in the rural areas against any departure from traditional construction systems and against new ideas in planning. This can be overcome by proper dissemination of new knowledge or information. There is lack of effort on the part of those concerned with building construction to demonstrate innovations for social and economic benefit. There also exists, in many countries, a general hesitation on the part of innovators to come into the field of actual construction and production and to bring forward their research for public criticism and evaluation.

As national governments are the heaviest investors in building, it is necessary that they take steps to enrol the support of the rural people who will be undertaking construction. Adequate funds should be set apart by governments to construct prototypes with new techniques such as prefabricated elements and to see that these prototypes be used to develop an appropriate climate of public opinion. The awareness of new ideas on the part of the public will not only create a market for them but will also hasten the raising of living standards through the spread of economical and quick construction systems. Government support of innovative partial prefabrication and its acceptance on a large scale in their building construction programmes will lead not only to economy, but to the provision of job opportunities for the unemployed.

Labour-intensive prefabrication has thus an important potential and is the first proper step towards industrialized buildings. Its benefits in terms of economy, quick construction, quality control and—above all—employment potential, will help to change the attitudes of the people and should serve to usher in a new era in rural building construction in Asia.

Indian experience of labour-intensive prefabrication

A number of countries in the Asian region have tried industrialized building methods, system building and labour-intensive prefabrication in the construction of school buildings with varying degrees of success. One such effort in the State of Uttar Pradesh in India is discussed below in order to share experiences thus obtained.

The State of Uttar Pradesh had a population of about 88 million in 1971. It has 111,722 villages, scattered in different geographical situations and it needs 67,000 primary schools by the year 1978. The problem was therefore to construct schools much more speedily and economically than those which were being built using traditional techniques of construction. The State Government of Uttar Pradesh approved a construction programme of 5,500 schools and allocated Rs. 50 million (US $5.5 m) for the

Plate 6. One of the two-classroom schools completed. In the winter months, the children prefer to sit outside in the warm sun for lessons. The teacher uses the external chalkboard (on the left).

purpose, at a rate of Rs. 8,500 (US $950) per school of two classrooms in the first stage. A study of the situation demanded a new approach to the design and construction of these schools. The need to complete a construction programme of over 5,000 two-classroom schools, (Plate 6) in a period of three years, and on highly varied terrain suggested the use of techniques which would permit the rapid erection of buildings. Equally important was the need to use local materials, skills and labour.

Prefabrication in reinforced concrete seemed to provide a possible answer. In the context of the rural situation of the school sites, simplification of casting methods, joint details, erection methods and minimizing the use of skilled labour was considered important. Techniques for both sloping and flat roofs were developed such that:

- There was a minimum number of standard components;
- Concrete components were simple to cast, thus reducing the need for skilled labour;
- The components were designed to be transported using rural modes of transport, for many sites were accessible only through the use of bullock carts;
- The components were light enough for manual handling into position in the building;
- Joints between components were simple.

A comparison of the costs between traditional construction and prefabricated construction indicated about 20 per cent saving in the latter. Local building materials were used for all elements except for the prefabricated skeleton and roofs. The average time taken for the completion of one school amounted to half that taken by traditional construction. Besides catering to the social needs by providing a high number of primary

school buildings within the limited financial resources, the project employed not only engineers and technicians but also unskilled village labour. It provided employment opportunities for about 2.3 million man-days of which about 0.67 million were for skilled workers and about 1.6 million for unskilled village labour.

Management of the project

Zila Parishads (District Boards), which are the normal construction agencies for village schools, were not organized to manage time-targetted construction on a mass scale due to their time-consuming administrative, financial and constructional procedures and to the non-availability of adequate technical staff. They would also have found it difficult to construct schools within the cost ceiling. Instead, the State government sought the assistance of the Central Building Research Institute (CBRI), a building research laboratory, which was responsible for the development of both the plans and the construction system of the new schools. The institute undertook the project since it would introduce its development work to the interior villages of the State, with possible extension subsequently to cover the entire country. The important task of planning included: orientation and training of the staff; preparation for the commencement of construction; centralized prefabrication of components; award of contracts; preparation for work on site; and supply of materials to sites.

Centralized prefabrication of components

The prefabricated components of the new school buildings comprise pre-cast concrete channel units for roofing, (Plate 7) roof trusses, lintel-cum-sunshades and wooden doors and window shutters. Specialized

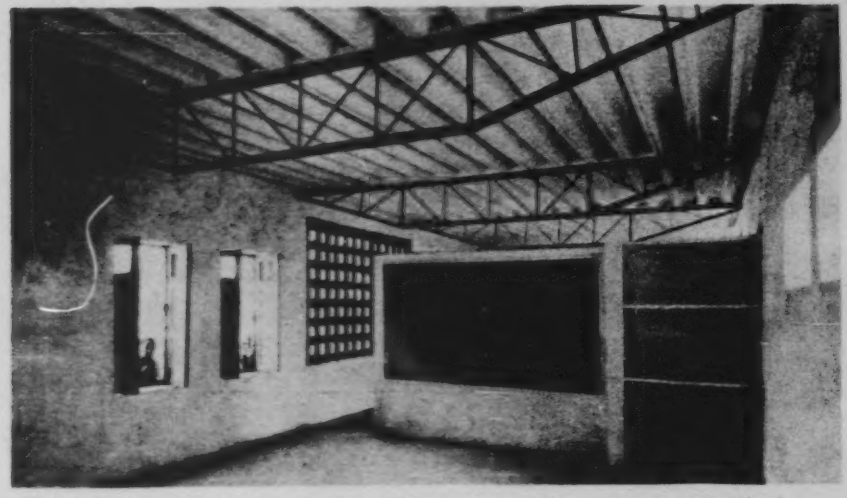


Plate 7. Pre-cast concrete channel units on light steel trusses form the roof of the school.

Plate 8. At the casting centres, only a concrete mixer and a vibrator are used to make the channels. All other work is manual, hence labour-intensive.

techniques were involved in prefabricating these units. No contractors with expertise in prefabrication work and able to meet the estimated cost targets were available in the beginning. Thus casting yards at district headquarters were preferred due to the availability of electric power and water. Centralized casting also permitted better quality control. No machinery or equipment except vibrators and sometimes concrete mixers were used in the project. (Plate 8)

Award of contracts

Experience showed that with the introduction of the new technique using prefabricated components, the open tender system of contracting led to high tender rates, in addition to being time-consuming. It was therefore decided to award the contracts through negotiations based on technical analysis.

The project staff also demonstrated the prefabrication techniques and pursuaded local entrepreneurs, unemployed engineers, local co-operative ventures of engineers and contractors to enter into prefabrication contracts.

Preparation for work on site

Contracts for work at the site were normally awarded to rural entrepreneurs with a view to encouraging the rural economy through the employment of local labour. In the beginning, there were difficulties in finding rural contractors willing to undertake school building construction work. Rural skilled labour was also scarce. The project staff, however, soon interested the local people by demonstrating how they could construct these simple buildings themselves. The methods used gained

popularity with the village people. The terms of payment for contracts were also liberalized to make it easier for village job contractors to take up the work.

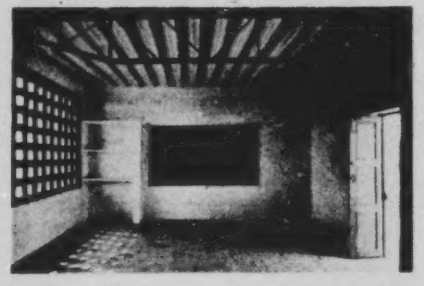
Financial management

To rationalize quick payments to the contractors for work, a number of measures were taken to simplify and streamline procedures:

- As the work was of a repetitive nature, the conventional method of recording measurements of work in the standard measurement books was modified to avoid entries for each contract. This saved the time of staff working on the site.
- Running payments were allowed against materials supplied or work in progress to the extent of 75 to 90 per cent of the value of material supplied or the work done. This enabled small contractors to sustain themselves until the end of each contract.

Some conclusions

Labour-intensive prefabrication has tremendous potential for rural schools in the Asian region. A well-planned effort is needed to seek the co-operation and assistance of local people in school construction programmes; this is all the more necessary in view of past failures in blindly applying sophisticated techniques adopted from advanced countries. It is important, however, that local leaders be taken into full confidence before any large-scale construction programme is launched; otherwise irrelevant criticism from certain sectors of the population mars the enthusiasm of the workers and supervisors. Education about the benefits of such programmes is likely to lead to the easier acceptance of new systems by the people. The potential of school construction systems for use in buildings like rural houses and other types of buildings also needs to be highlighted. The quality of performance, economy, employment-potential and time-saving characteristics are the positive assets of well-designed systems of partial prefabrication for rural schools.



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THE INDONESIAN 'INPRES' PRIMARY SCHOOL BUILDING PROGRAMME

Country background and administration

Indonesians think of their nation in terms of both land and water, which to them have a natural and inevitable relationship. According to one government source, the archipelago has a land area of about 1,951,257 square kilometres distributed among 13,677 islands, extending some 5,440 kms. from east to west and 1,760 kms. from north to south. The area of water is about four times the land area (refer to map overleaf). Of the total number of islands only 922 are inhabited, with five of the largest—Sumatra, Java, Sulawesi, Kalimantan and West Irian—accounting for nine-tenths of a population numbering 136,540,000 in 1974. Along the length of the archipelago are found huge volcanic mountains—some of which are still active—dense jungles, long ribbons of sandy beaches, mountain lakes, rushing rivers and waterfalls.

The tropical climate of Indonesia is moderated to some extent by its situation between two continental land masses and by wide differences in elevation. The climate of the lowlands is marked by heavy rainfall, low winds, high temperature and very high humidity. There is little or no variation between the warmest and the coolest months and the humidity averages over 80 per cent the year-round. The daily mean maximum and minimum temperatures range between 30°C and 20°C.

Rainfall is nowhere less than 1,000 mm a year and in the equatorial rain belt that covers most of Sumatra, Kalimantan, and Sulawesi, rainfall of 2,500 mm is regularly recorded.

The major part of all government administration is in the hands of the central government, which maintains an administrative service under the Director General for General Administration and Regional Autonomy of the Department of Interior. This extends down to the sub-district level and most government departments have offices at the province, district (regency), and sub-district levels. There are, in addition to the 18 departments, each headed by a minister, five State ministers who are not departmental heads but who are assigned specific responsibility, largely of a co-ordinating nature.

The country is divided administratively into 26 autonomous First Order Regions or Provinces, which are further subdivided into regencies

Simplified map of
INDONESIA
South China Sea
Pacific Ocean
SUMATRA
KALIMANTAN
SULAWESI
WEST IRIAN
JAVA

(kabupaten) or municipalities *(kotamadya)* and sub-districts *(kecamaten)*. Each province is headed by a Governor who is nominated locally but appointed by the central government. A regency or municipality is headed by a chief executive—the *bupati*—and the sub-districts by a *camat*—all civil servants under the Directorate for General Administration and Regional Autonomy, of the Department of Interior. It will be seen later that the *bupati*, through the Department of the Interior, plays a key role in the implementation of the INPRES school building programme (the term INPRES is used as an acronym for all instructions or decrees signed by the President of the Republic).

Administration at the first level of education is dualistic. Educational facilities, equipment, supplies and teachers' salaries are provided by the provincial government, while curriculum and supervision are controlled by the Ministry of Education of the central government. At the provincial level, the governor is represented by his education office and the central government by the office of the primary school supervisor.

Events leading up to the INPRES programme

After the Indonesian proclamation of Independence on 17 August 1945, it was agreed that a strong education system would help in achieving a just and prosperous society. This ideal was then moulded into the 1945 Constitution, and has become the ideological principle for the Republic of Indonesia in implementing its development programme in all sectors, including education. Education now has the full support of the central government, and the people themselves realize its importance. At the same time there has been a high increase in the population with the consequent increase in enrolments.

While the enrolments are increasing, the gap between those children who are able to attend school, and those who cannot, continues to exist. According to the 1971 census there were 28,383,268 children in the 7-12 age group, whereas the total 1971 enrolment in public, private and religious schools was about 16,374,000. Moreover, there were fewer opportunities for access to education for the children of low-income groups in the cities and the children living in villages.

This situation could not be allowed to continue, and the Indonesian Government reached two main decisions of high priority. One was a qualitative decision affecting curriculum development for the first level of education—the Third IDA Education Project—which had as its objectives:

1. The production of new books and teachers' manuals and their distribution free of charge to all primary school pupils;
2. In-service training programmes for all primary school supervisors, headmasters and teachers as well as tutors for mobile teacher training teams;

3. Experiments in the development of a modular approach to learning in both first and second levels of education through a number of 'Development Schools'.

The second was a quantitative decision, through a series of Presidential Instructions (INPRES) to increase the learning opportunities for the children in the age-group 7-12 years with a massive aid programme for the construction of primary schools, with a target objective of 85 per cent of this age group attending school by the end of 1978. It is this programme that is described in this article.

Scope of the programme

The aid programme, the elements of which are summarized in Table 1, not only provides for the construction of school buildings but includes the supply of school furniture and equipment, toilets and clean water supply. In addition to the physical plant, provision is made in the aid programme for the recruitment and appointment of teachers, the supply of textbooks and teachers' manuals and the provision of children's reading books for the school libraries. In order that the effectiveness of the supervision of the schools can be increased, provision of transport facilities in the form of motor bikes, jeeps and motor boats is also included. Phases III (1975) and IV (1976) also include a provision for the upgrading and rehabilitation of the existing primary schools as well as the teacher training schools. The aid programme is thus a complete package for educational development. It has as its objectives the expansion of learning opportunities for the prospective Grade I pupils who cannot be accommodated in the existing primary schools, especially in rural and remote areas and in urban areas of predominantly low-income populations.

It is the massive scale and rapid implementation of this aid programme that is so remarkable. Phase I (INPRES No. 10/1973) provided for the construction of 6,000 school units, with a total of 18,000 classrooms, together with furniture and equipment, a teacher's room, toilets and clean water supply under a budget allocation of US $38.2 million. Due to a late start in the implementation of the first Phase, the 18,000 classrooms were constructed in the incredibly short time of three months—which also included the selection of the sites for school buildings.

Phase II (INPRES No. 6/1974) provided for a further 6,000 school units (18,000 classrooms) together with furniture, equipment and toilet and a budget allocation of US 438.83 million. The second-phase units were constructed on the sites of the buildings of the first phase, and the construction time was more evenly spread through the year with the consequent smoother implementation of the programme.

Phase III (INPRES No. 6/1975) provides for the construction of 10,000 school units, with a total of 30,000 classrooms, teacher's room,

Table 1. Development of primary education

COMPONENTS	P3D	INPRES 10 (phase I)	INPRES 6 (phase II)	INPRES 75/76 (phase III)	FOR CONSIDERATION (phase IV)
1. Curriculum	.	.	.	.	Dissemination of Curriculum
2. Manuscript preparation	Bahasa Indonesia, Gr I-VI Mathematics Gr I-VI Science Gr IV-VI	.	.	.	Science Gr I-III Social Science Gr I-II Sport, Art, Skills, Religion
3. Book Production	Social Science III-VI				
Textbooks	Bahasa Indonesia, Mathematics, Science, Social Science (Primary)	Bahasa Indonesia, Mathematics for INPRES schools Gr I (6,000 schools)	Bahasa Indonesia, Mathematics for INPRES schools Gr I (6,000 schools)	Bahasa Indonesia, Mathematics, Social Science Gr III for 6,000 schools and Bahasa Indonesia, Mathematics Gr I (10,000 schools)	Book printing: Science Gr I-III Social Science I-II Sport, art, skills and religion
Readers	.	100 books/titles each primary school	100 books/titles each primary school	100 books/titles each primary school and each INPRES school	.
4. Teaching materials	2,201 Central schools including radios, flannel boards, battery charger, Science equipment, Mathematics, Social Science and Bahasa Indonesia	.	.	.	Other schools must also be replenished
5. Buildings					
Construction	.	6,000 schools (3 classes)	same	10,000 schools	.
Upgrading	.	.	.	10,000 schools each ½ million Rps.	Upgrading of other primary schools using higher unit cost
6. Furniture					
Supply	.	Desks and seats 6,000 primary schools	Desks and seats 6,000 schools	Desks and seats 10,000 schools	.
Upgrading	.	.	.	.	Blackboards, benches, teacher's tables, cupboards etc. must be improved
7. Teachers					
Pre-Service New Teachers	Upgrading Curriculum according to primary development. Distributing learning facilities to 60 Primary Teaching Training School	.	.	Upgrading Primary Teaching Training Schools in part	More widespread upgrading of Primary Teaching Training Schools
Appointment of teachers	.	18,000 teachers	18,000 teachers	30,000 teachers	Additional teachers needed to replace those pensioned
Upgrading	All primary teachers inspectors at all level	.	36,000 INPRES primary teachers	48,000 teachers	Increase status of primary teachers so all have Primary Teaching Training School's Certificate
8. Office Equipment	.	.	.	.	Schools should have type-writers, duplicators, calculator
9. Office supplies	.	.	.	.	Availability of these writing materials to be considered
10. Supervision					
Transport	1,601 motor bikes for Sub-District Supervisor	26 Jeeps for Provincial Supervisor, 281 motor boats for District Supervisor, 439 motor boats for Sub-District Supervisor	1,382 motor boats for Sub-District Supervisor, 69 outboards for Sub-District Supervisor, 73 inboards for Sub-District Supervisor	.	Jeeps for District Supervisor to be considered
Supervisor's office	.	.	.	.	Must be upgraded
Official housing	.	.	.	.	Must be considered
Office equipment	.	.	.	.	
11. Obtaining ETV	.	.	.	.	TV sets
12. Manuals	.	.	.	.	All kinds to be used

furniture and equipment, toilets and clean water supply under a budget allocation of US $113.68 million. Also included in Phase III is the rehabilitation of 10,000 existing schools with a budget allocation of US $12.1 million. The school units in Phase III are being constructed on new sites; the latest information is that the construction of the schools is well under way.

The Presidential Instructions make very clear that this aid programme does not abolish or replace the continuing responsibility of the provincial governments to step up and expand basic education, from their own sources of revenue, or the duty of the provincial governments to continue to provide subsidies and other assistance to the districts and municipalities. Moreover, the provincial governments are required, under the Presidential Instructions, to provide land for the school buildings, (a minimum of 1,500 m^2 for a 6-classroom school) which is to be legally and financially acquired. The provision of land forms the main contribution by the provincial governments to the aid programme. The provincial governments will be expected to make up any short-fall in the financial contribution of the central government and to maintain the school buildings on completion, with the assistance of the local community.

Responsibility for the implementation of the programme

Presidential Instructions for the realization of the aid programme were issued to: (1) the Minister of the Interior; (2) the Minister of Education and Culture; (3) the Minister of Finance; (4) the Minister for Public Works and Electric Power; (5) the State Minister for Economy, Finance and Industry/Chairman of the Board of National Development Planning (BAPPENAS); and (6) the State Minister for State Administration Reform.[1] It is the responsibility of these six ministers to implement the programme in accordance with their appropriate authority.

Further guidelines for the implementation of the programme are covered by a joint instruction issued by the ministers concerned, and are further expanded by a series of instructions issued jointly or separately by them, to all provincial governors, *bupatis* and heads of the provincial offices of the Department of Education and Culture who are required to implement the programme through the heads of the sub-districts. These guidelines and instructions, which are compiled into an 'Implementation Manual' and distributed widely to all levels, are very precise, and deal, step by step, with all aspects concerning the implementation of the programme. The manual includes sample letters for the appointment of the Board of Operational Supervisors; (which is responsible for the day-to-day implementation of the programme); the calling of bids for construction of the school buildings and the appointment of the contractor, a sample

1. This department is responsible for realizing an effective and efficient state apparatus.

form of building contract; and sample forms for reporting on the various stages of the implementation of the programme. The instructions are in such detail that even the size and the wording of the display board to be erected at each completed school are included.

The successful implementation of the aid programme is due, by and large, to the care with which these instructions were prepared; the pre-planning of the whole operation at the central level; the early involvement of the provincial governments and the complete decentralization of operations at the district level.

As the aid programme for the construction of school buildings is in fact a subsidy to the provincial governments, the overall responsibility for its implementation, including the supply of furniture, rests with the Minister of Interior. Under the direction of the Minister of Interior, a National Supervisory Team for the project was set up at the central level consisting of representatives of the six ministries concerned together with representatives from the Indonesian People's Bank, the Export-Import Bank and the Government Personnel Administration Board (BAKN). This team was responsible for the planning, directing and supervising of the construction programme, solving any problems arising and evaluating the implementation of the programme. A similar Supervisory Team, having duties conforming with those of the national team was set up at the provincial level under a letter of decision issued by the provincial governor.

The governor of each province is responsible for the smooth implementation and reporting of the construction programme in his territory with the *bupati* in each district or municipality nominated as the head of the project. The *bupati* is the key in the whole operation, since he is the man responsible for the implementation of the construction programme in the districts and sub-districts and is the authority for the final approval of the location of the school, for signing the construction contracts and for the disbursement of funds.

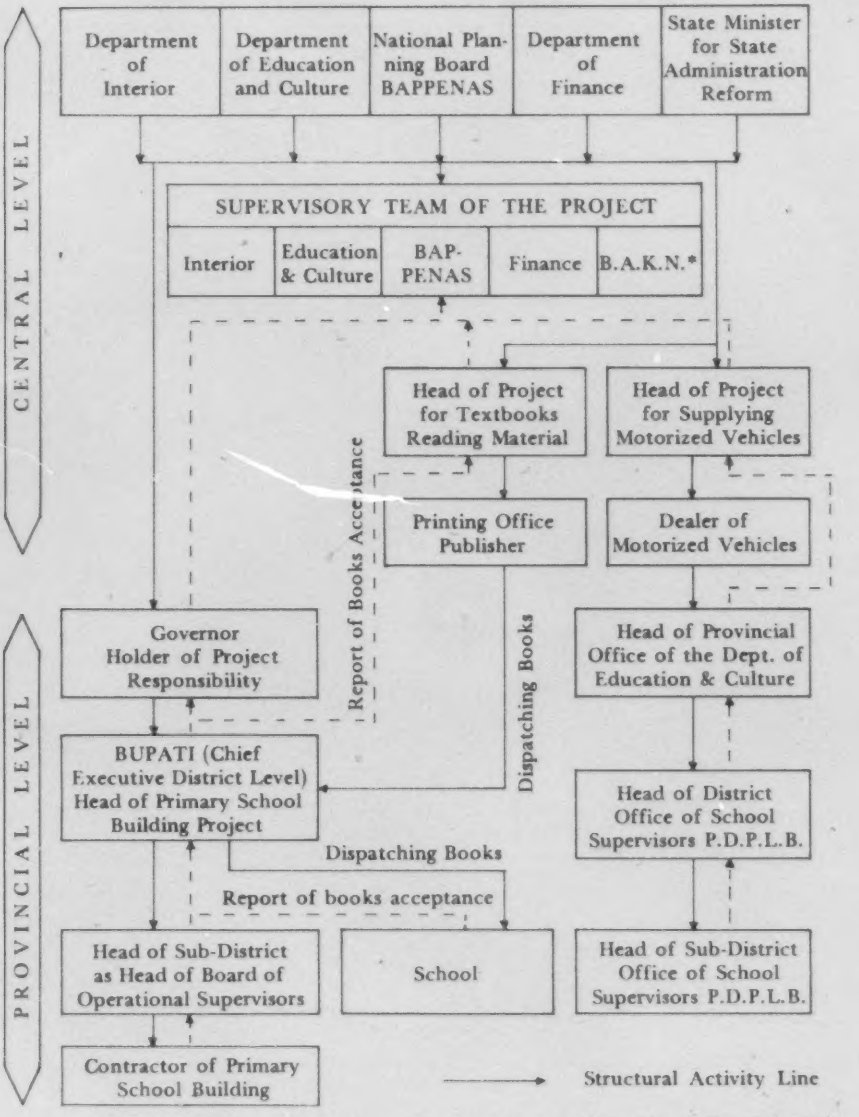
The day-to-day control and supervision of the construction projects in each sub-district is the responsibility of the Board of Operational Control appointed by the *bupati* in his functions as head of project. This board consists of the *camat* (Head of the sub-district), the head of the Office of School Supervisors for Primary Education and an official of the Public Works Department. The chain of responsibility is shown in Figure 1, overleaf.

Programme planning

The planning and preparation of the programme is carried out by both the central and provincial governments. The activities of the central government include the following:

1. The allocation of funds and the allotment of primary buildings to each district in all provinces;

FIGURE 1. SUPERVISORY STRUCTURE OF PROJECT OF THE INPRES PROGRAMME FOR THE CONSTRUCTION OF PRIMARY SCHOOLS


CENTRAL LEVEL
Department of Interior
Department of Education and Culture
National Planning Board BAPPENAS
Department of Finance
State Minister for State Administration Reform
SUPERVISORY TEAM OF THE PROJECT
Interior
Education & Culture
BAP-PENAS
Finance
B.A.K.N.*
Head of Project for Textbooks Reading Material
Head of Project for Supplying Motorized Vehicles
Printing Office Publisher
Dealer of Motorized Vehicles
Report of Books Acceptance
Dispatching Books
PROVINCIAL LEVEL
Governor Holder of Project Responsibility
Head of Provincial Office of the Dept. of Education & Culture
BUPATI (Chief Executive District Level) Head of Primary School Building Project
Head of District Office of School Supervisors P.D.P.L.B.
Dispatching Books
Report of books acceptance
Head of Sub-District as Head of Board of Operational Supervisors
School
Head of Sub-District Office of School Supervisors P.D.P.L.B.
Contractor of Primary School Building
Structural Activity Line
Operational Reporting Line

* Board of Administration for Government Civil Service

2. The allotment of books and reading materials to be distributed to each district;
3. The determination of unit costs of the school buildings for each province, the costs being adjusted to take into account the variation in building costs between provinces;
4. The preparation of schematic designs for the school buildings and an outline specification; emphasis is laid on the use of materials available in the locality of the schools;
5. The recruitment and appointment of primary school teachers for the new schools.

The following activities are carried out by the provincial governments through the head of the project (Table 2, on page 156, sets out in further detail the programme of activities):

1. The determination of the location of the school and the final allocation of funds for the construction of the buildings;
2. The preparation of the working drawings and specifications, and the expenditure analysis.

The allocation of schools is proportionally distributed for each province in accordance with the projected increase in the school-going age population throughout Indonesia during the period 1972 to 1978. This allocation may be adjusted through consultations between the central and provincial governments. The actual location of the school is determined by the *bupati* after considering the proposals and suggestions of the head of the sub-district and the inspector of primary schools and in accordance with the following criteria:

1. The school should be located in a village where children are unable to enter the first grade in the existing schools, with particular reference to the remote areas;
2. The areas should comprise of predominantly low-income population in towns and cities;
3. Transmigration projects[2] and frontier areas which need schools should be chosen.

Additional factors to be taken into consideration are:

a) communications and transport conditions;

b) safety and environmental health;

c) the availability of other public facilities.

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2. A government project for the resettlement of some of the population from densely populated Java to the outer islands.

Table 2. Programme of activities for the implementation of the Presidential Instruction primary school building construction

	Stages	Ministry of Finance.	Supervisory Team from National Planning Board, Public Works, Ministries of Education and Culture, Interior Finance.	Governor, Representative of the Ministry of Education and Culture, Ministry of Public Works.	Bupati (Head of the project), Primary School Inspectors, District Office of Public Works.	Board of operational supervisors: Subdistrict head (Chairman) Primary Schools Inspector, District Office of Public Works.	Contractor or direct management.
March	Preparation		Expand information on implementation manual. Distribute implementation manual.	Receive information on implementation manual.	Receive information on implementation manual.		
					Together determine location of buildings, acquire land for school building. Decide whether to employ Contractor/self management.		
April May	Planning	Issue SKO (letter of authorization) and send to provinces at the time it is needed. Release funds through Head Office Government Bank to Branch Offices of Bank.		Receive implementation manual: - Give technical guidance/ assistance/consultation to the districts in preparation of: - Bidding documents/ implementation - Work control system implementation (if work is carried out by direct management no contractor is needed).	Preparation of drawings specification and contract documents based on schematic designs contained in guidelines. Investigate local capacities, availability of materials, call bids or arrange for self management.	Take possession of the site. Investigate competency of contractors. Arrange executive apparatus when the operation is self managed.	
June	Bidding/tender			Give technical guidance and control so that the bidding is conducted correctly.	Evaluate, bids, acceptance of work, issue SPBK (letter of authorization).	Invite Contractor, evaluate bid, propose contractor.	Obtain tender documents, prepare and submit proposal. Receive SPBK.
July	Construction of the Building				Prepare and sign work contract. Send documents on: - tender proposal - permission to work (SPK) and - contract to the governor.		Sign contract. Implementation of building construction in accordance with the Contract, Drawings, Specification, Direction from Supervisory Teams.
August			Examine and evaluate monthly report. Prepare periodical report for the Minister of Interior and to the President on progress of work including financial statement.	Give guidance on supervising the construction of the building, financial administration, monthly reporting.	Give technical guidance in controlling and administration of the construction programme. Manage the construction programmes in the districts.	Operational control to ensure that the work is carried out according to the: - Contract - Drawings & Specification - Give technical guidance to contractor/self management.	Conform to regulations/rules in construction technique.
September				Evaluate the monthly report on implementation, financial administration, progress of work.	Evaluate the period reports from subdistricts.		
October			Supervisory missions to provinces/districts. To verify local condition, collect data and suggestions for improvement of the manual and future programmes.	Prepare monthly report to the Ministers of: - Interior - Education - Finance - State Minister of Economics/Chairman, National Planning Board.	Prepare and send monthly report (the latest on the 15th of the following month) on the whole construction/rehabilitation activities to the Governor. Make payment to Contractor.	- Periodical report on progress of work. - Submit weekly, report on progress of construction to the Head of Project (the latest at the week end of the following week).	
November				Prepare and submit data (cost of local materials and wages, suggestions for improvement of future primary school building construction scheme.	Collect and send data (cost of local materials and wages) for future primary school building construction scheme.	- Take over building first stage.	Hand over building first stage.
December						- Continue control of maintenance: contractor has to complete and repair defective work etc.	Repair defective work, finish maintenance work.
					Take over building.	Final taking over of building.	Final handing over of building
January	Utilization				Hand over school to Headmaster.		

Unit costs and standard plans

The unit costs for school buildings are fixed at the central level and take into account the variation in building costs throughout Indonesia. These are summarized in Table 3.

Table 3. Unit costs* of school buildings for Phase I, II and III in US dollars

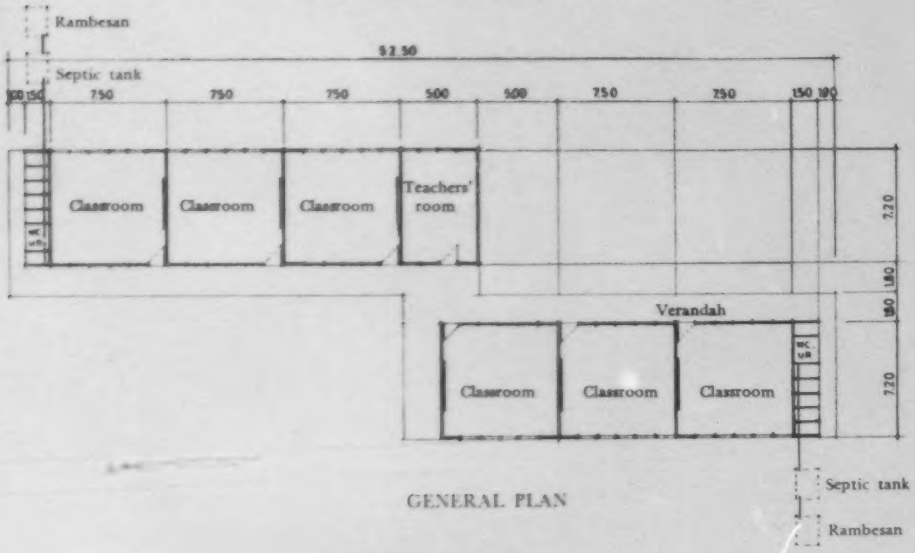
Province	Phase I. 1973/74			Phase II. 1974/75			Phase III. 1975/76		
	Unit - 3 Classrooms Teachers room and Toilets - 264 m^2			Unit - 3 Classrooms and Toilets - 219 m^2			Unit - 3 Classrooms Teachers room and Toilets - 264 m^2		
	Cost $ per unit	Cost $ per place	m^2	Cost $ per unit	Cost $ per place	m^2	Cost $ per unit	Cost $ per place	m^2
Sumatra, Java, Bali, Kalimantan (excluding Jakarta and each provincial capital)	6 024	50.20	22.80	6 024	50.20	27.50	9 369	78.00	36.50
Provincial capital in Sumatra, Java, Bali and Kalimantan	7 229	60.24	27.38	7 229	60.24	33.00	10 843	90.36	41.07
Sulawesi, Nusa Tenggara Barat, Nusa Tenggara Timur	7 229	60.24	27.38	7 229	60.24	33.00	10 843	90.36	41.07
Jakarta Metropolis	16 867	140.56	63.89	16 867	140.56	77.00	20 482	170.68	77.58
Maluku	8 434	70.28	31.95	8 434	70.28	38.51	12 048	100.40	45.64
Irian Jaya	12 048	100.40	45.64	12 048	100.40	55.00	15 663	130.53	59.33

* Unit costs include furniture and equipment for 120 pupils and 3 teachers.

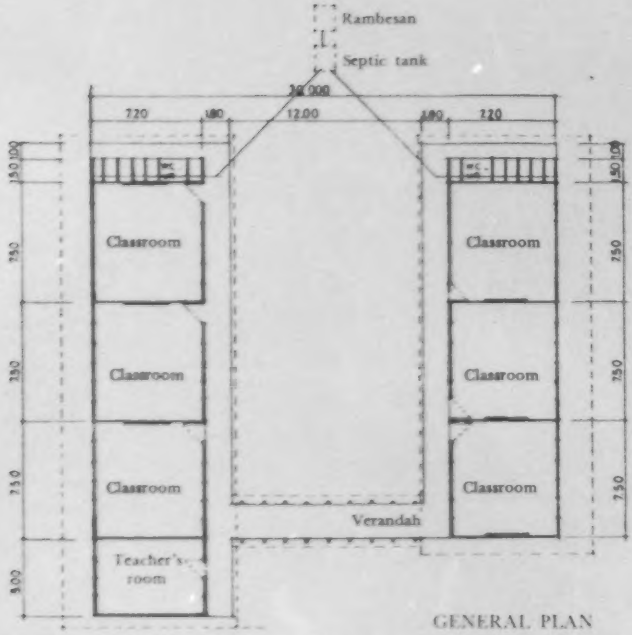
If the funds allocated for each unit of a complete building are insufficient, the deficiency is to be made up by the provincial government and the community. If there is a surplus of funds, the *bupati*, in consultation with the inspector of primary schools, is required to use these surplus funds for the construction of additional classrooms or for providing additional school equipment.

Schematic designs for the proposed school buildings (Figures 3 and 4) are prepared at the central level by the Bureau of Construction of the Department of Education and Culture. These designs are included in the Implementation Manual, together with some recommendations on the type of building materials to be used in the provinces.

FIGURE 2. TWO SCHEMATIC DESIGN LAYOUTS OF SCHOOL UNITS FOR THE INPRES PROGRAMME

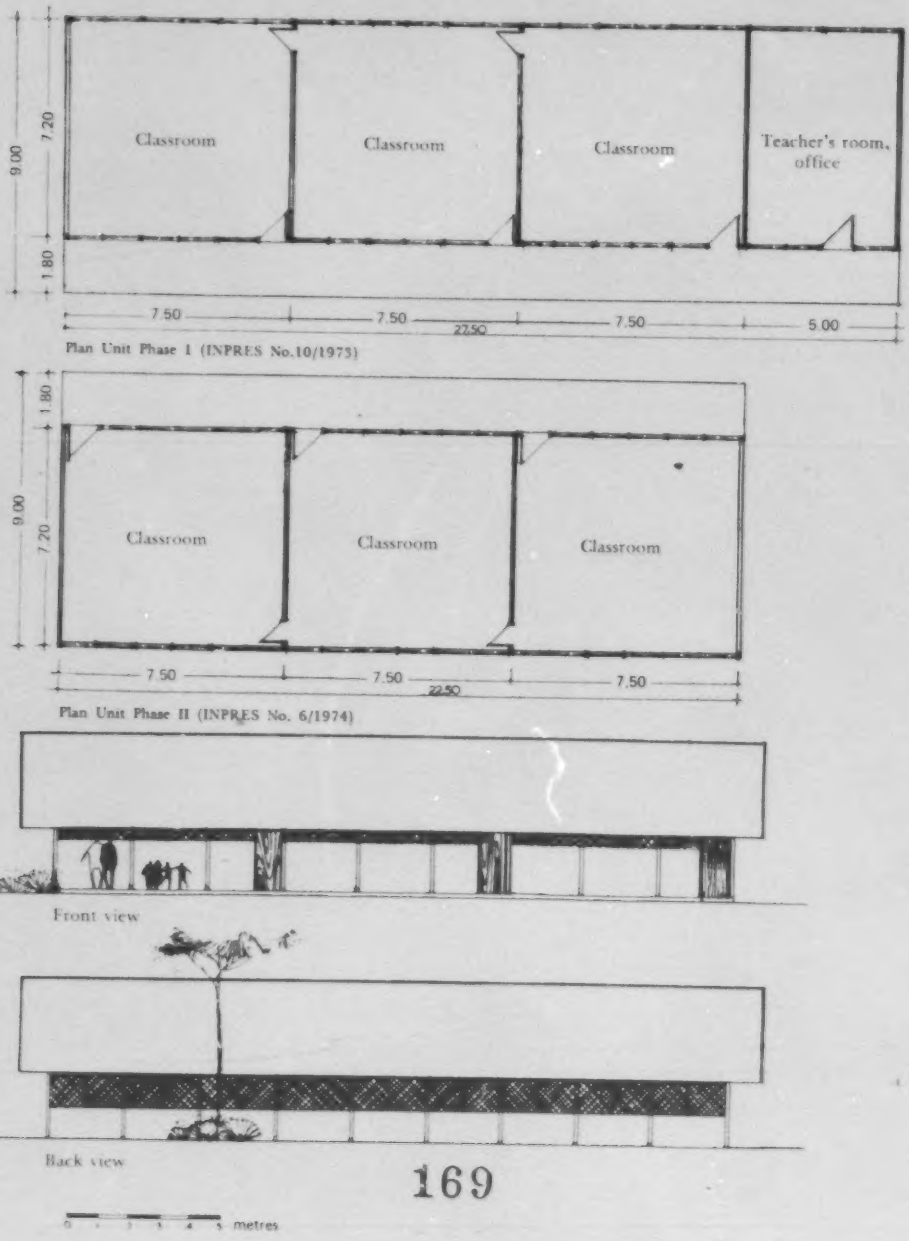


GENERAL PLAN



GENERAL PLAN

FIGURE 3. SCHEMATIC DESIGN OF SCHOOL UNITS FOR THE INPRES PROGRAMME



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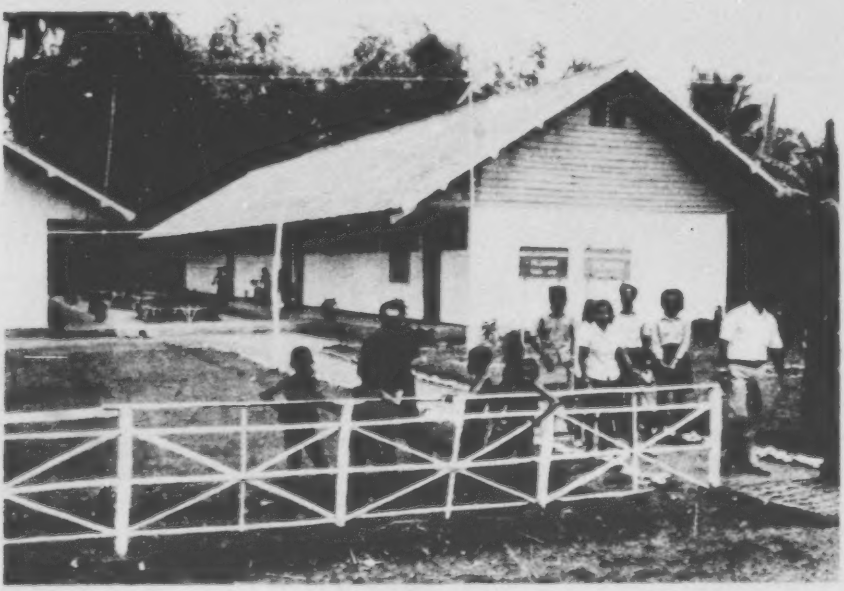
The schematic designs and outline specifications are developed into working documents at the provincial level by the district office of the Public Works Department which takes into account the local building practices and regulations and the availability of materials in the locality. The district office of the Public Works Department advises the *bupati* on the costs of the building and the allocation of funds, and approves the recommendations for the award of building contracts made by the Board of Operational Supervisors at sub-district level. A levy of 2-5 per cent of the total costs of the project is made for the design, supervision and contract management services. Construction of the school buildings is carried out either by a building contractor on tender, or through the community by direct labour and self-management.

Where the work is carried out by a contractor, preference is given to one resident in the locality who has a good record for completing his contracts. This policy decision was made with the aims of stimulating the local economy and encouraging the local community to take part in the development. Those local contractors having little capital are nevertheless entitled to receive priority in the development of their enterprise so long as they are technically qualified and trustworthy and their work is satisfactory. The contractor is required to enter into a formal contract with the head of the project and must conform to current laws and building regulations.



INPRES school unit erected in Madura, East Java. Brick walls, clay-tiled roof.

INPRES school unit erected in southern Sumatra. Timber-framed walls, corrugated iron roof.

Disbursement of funds

The allotment of funds to the provinces for the construction of the school buildings is made at the central level; these funds are made available by the Minister of Finance at the request of the Minister of Interior through the Head Office of the Indonesia Peoples' Bank or other government bank. The transfer of funds to the districts and municipalities is made by the head office of the bank concerned through its nearest branch. Where there is no branch of any government bank in the district, the funds are channelled directly through the *bupati* who then makes cash payments to the contractor or to the community executing the building works under self management.

The concept of channelling the funds through the government banks rather than through normal government channels is an effective one and has helped to speed up the making of payments to the contractors. Also, as the branch offices are required to submit monthly reports to their head offices who are in turn required to submit reports to the national supervisory team, these reports serve as a useful crosscheck on the progress of a project and on the expenditure of funds.

The terms and stages of payments to be made to the contractor are clearly set out in the conditions of contract; five per cent of the value of work completed is retained at each stage where payments are made to the contractor. The final five per cent of the contract sum is paid at the end of the 'maintenance period'; i.e. the period—in this case 30 days—after the building work is complete and during which time the contractor is required to make good any defects caused through poor workmanship or the use of

poor materials. The contractor submits his claim for payment to the *bupati* (head of project) together with the contract agreement and a certificate from the *camat* (sub-district head) certifying the amount to be paid, the amount previously paid and a report on the progress of the work. Subject to the claim being approved by the *bupati*, payment is made by a cheque drawn on the local branch office of the bank. In normal circumstances the contractor receives payment within seven days of submitting his claim.

One other interesting point is that the personal tax, which is the responsibility of the contractor, and the State income tax, which is the responsibility of the project, are collected by the banks at the dates due in conformity with the current tax laws and immediately transferred to the account of the State Treasury.

INPRES school library

On completion of the building works and the supply of furniture, the central government transfers the school to the provincial government of the district or municipality concerned and the maintenance of the building and equipment thereupon becomes the responsibility of the provincial government and the community.

Interior of an INPRES classroom

Reporting

Reporting on the progress of the programme plays a very important role in monitoring its implementation. The system of reporting requires the submission of monthly reports at all levels of operation starting from the sub-district office. This office reports to the head of the project who in turn presents a consolidated report to the governor of the province. The governor is required to submit a consolidated report, together with a copy of the report from the Heads of Project, to the Minister of Interior, the Minister of Education, the Minister of Finance, BAPPENAS and the Supervisory Team of the Project. The branches of the Indonesian Peoples' Bank or other government bank have also to make reports on the expenditure to their head offices who in turn are required to submit consolidated reports to the Ministers of Finance, Interior, and Education and to BAPPENAS. Finally, the Minister of Interior, who is responsible for the overall control of the implementation of the project of primary school construction programme, is required to submit to the President periodic reports on the physical and financial aspects of the implementation of the programme.

Through this system of reporting, each echelon at the central and provincial levels can monitor the implementation of the project. In addition, the reports submitted by the governors of the provinces and the branch offices of banks can be utilized for cross-checking on the accuracy of the reports.

Evaluation of the programme to date

The consensus of the officers concerned with the implementation of the first two phases of the programme is that the principal objective of the programme—to increase the learning opportunity for children in the age-group 7-12 years—has been achieved through the construction of the new school buildings. Whether or not the other major objective—to achieve a target enrolment of 85 per cent of the age-group 7-12 years by the end of 1978—will be achieved remains to be seen. A study of the implementation of the programme in East Java indicates, however, that the INPRES programme is having a significant impact on the participation rates in the villages that receive the new schools. This study also indicates that the objective of the programme of increasing the opportunity for education for the children of the poorer families, at least in the early grades, is being achieved. The study goes on to say, however, that ". . . since an even greater majority of parents of the children not attending school can be classified as poor, it might be concluded that the INPRES programme alone cannot overcome the economic reasons for children not attending school."[3]

3. Indonesia. Department of Education and Culture. *Summary of results of a study of the implementation of the national primary school building programme in East Java.* Surabaya, PROPPIPDA, (Department of Education and Culture of East Java), 1975. 16 p.

The first phase of the programme had to be completed within three months. This caused a hasty and inappropriate selection of school sites and the criteria for site selection given in the implementation guidelines were not always followed, with the result that some schools were constructed away from the most populated area and some of the classrooms were not used. The second phase of the programme required that the second unit of three classrooms should be erected on the same site as the first unit, but this requirement was not fulfilled in those locations where it was apparent that the enrolment during Phase I would not reach the targets.

Several of the problems met during the implementation of Phases I and II have been dealt-with, and new procedures introduced into the subsequent phases are the following:

1. Funds are now released at the beginning of the programme year, thus avoiding delays in construction due to late receipt of funds;
2. The difficulty in finding new sites has been overcome in some cases by building the new INPRES school on an old site where the existing accommodation is limited;
3. The condition restricting enrolments into the INPRES schools to grades I and II has been relaxed and many of the new schools now accommodate all grades and, even though separate schools may be operating in the same set of buildings, at least the teaching spaces provided are being fully utilized and ultimately the 'new' and the 'old' schools will be integrated into one unit.

Recommendations–(1) that the 'standard' allocation of six classrooms to all areas, particularly in the sparsely populated areas where demand for space is not so great, should be reconsidered; and (2) that there should be more than one design for school buildings, thus making it easier to adjust to the needs of the provinces–have yet to be incorporated into the Implementation Manual. Nevertheless, there are indications that in some areas these major considerations are being adhered to.

Some of the problems encountered are more difficult to resolve. Among these are the reluctance of building contractors to work in remote areas of difficult access, the shortage of skilled supervisors and the shortage of skilled labour. The last two problems have resulted in complaints that some of the new buildings are already in need of repair. Nonetheless, the construction programme of the first two phases has been completed and the implementation of Phase III is well under way. Moreover, there are clear indications that there is fairly broad community participation and that local government officers from all sectors have participated in the establishment of the new schools.

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SCHOOL BUILDING PROGRAMMES IN THE PHILIPPINES

A persistent problem facing the education administrators in the Philippines is the shortage of classrooms for both primary and secondary education. This situation has in the past forced the Department of Education and Culture to resort to such stop-gap measures as accommodating 50 or more pupils in a classroom; operating the schools in two sessions, renting of buildings not designed for school purposes and constructing temporary, short-lived buildings.

This situation is further compounded by an annual increase of more than a quarter million in the primary school enrolment and by periodic natural calamities—typhoons and flooding—particularly in Central and Southern Luzon, and parts of the Visayas region (the group of islands lying between Luzon and Mindanao). In the year 1973 alone, some 9,500 classrooms were destroyed, which marked a considerable set-back in the school building programmes.

Realizing that this state of affairs could not continue, the Government embarked on a massive school building programme which started in the fiscal year 1966-67 and achieved over a four-year period a remarkable record of construction. No fewer than 100,564 classrooms were constructed by August 1971 at an average rate of 22,000 classrooms per year; in all the previous years of educational history in the country, the maximum number of classrooms constructed over a four-year period had never exceeded 10,000. Nevertheless, despite this tremendous effort, the problem of shortage of classrooms still exists. It was estimated that in the fiscal year 1975-76 some 52,100 primary school classrooms were needed to clear the backlog of classroom construction and that about 6,800 new classrooms are required annually to meet the needs of the natural increase in enrolment and that about 2,000 damaged or dilapidated classrooms need to be replaced each year.

The latest ten-year primary school building programme in the Philippines has as its annual target the construction of 4,000 three-classroom units for the years 1976-1985, making a total of 120,000 classrooms. But even with the achievement of this goal there will remain an estimated shortage of 21,000 classrooms. Considering the annual production targets, the backlog of classrooms would not be cleared until 1992.

Thus the task confronting the Philippines is tremendous both physically and financially, requiring an estimated annual capital expenditure of approximately 210 million pesos (US $28,767 million) for primary school

classrooms only. In addition to the classroom needs for primary schools there is programmed the construction of industrial arts rooms and agricultural arts rooms for grade VI boys, and home economics rooms for grades V-to-VII girls, based on the allotment of one room for each 2,000 pupils enrolled, with an annual target of 255-rooms-each for industrial and agricultural arts and 510 home economics rooms. It is also planned to provide sanitary facilities and water at a rate of 500 primary schools annually.

Physical environment

Some of the difficulties of implementing the school building programme can be visualized from the physical environment of the country. The Philippines consists of some 7,100 islands extending north to south for 1,600 kilometres and east to west for some 1,000 kilometres (see map). The total land area is approximately 300,000 square kilometres, 95 per cent of which is contained in the 11 largest islands and 66 per cent contained in the islands of Luzon and Mindanao. Almost half the estimated population of 45,347,000 live on Luzon.

The many islands closely grouped together and separated by calm waters have made the Filipinos water-oriented people. Everyday communications make extensive use of water transport and dependence on waterways has profoundly influenced the settlement of the islands.

At sea level there are only slight variations in the average temperatures of 27°C from north to south and from month to month. Rainfall for the country as a whole is heavy—about 2,500 mm per year, but this varies greatly from place to place with the heavy rainy season caused by the monsoon off the Indian Ocean running from late June to October.

The Philippines are beset by the frequent occurrence of a number of natural disasters. The easternmost islands are located upon a geologic

Plate 1. A school semi-destroyed by typhoon winds

fault, and destructive earthquakes are frequent. There are many active volcanoes. The country lies astride the typhoon belt which originates near the Marianas and approaches the Philippines from the east. These typhoons are most frequent from July through November. Out of an average of 20 typhoons each year, aroun d 15 affect the Philippines with at least heavy rains; five to six of these strike with destructive winds and torrential rains, to be followed by devastating floods (the typhoons rarely strike Mindanao or the Sulus).

Review of the primary school building programmes

In order to solve the nationwide school building problem, the President of the Republic created in May 1964 a Presidential School Building Committee charged with the responsibility of formulating and implementing a nationwide school building programme. The committee was at that

time composed of: the Executive Secretary (Chairman); the Secretary of National Defense; the Secretary of Education; the Secretary of Public Works; the Commissioner of the Budget; and the Presidential Assistant on Community Development. The Chairman was authorized to designate any government official as executive officer and empowered to engage any government officer or agency employee to assist the committee. The composition of the committee changed over the years and in 1968 comprised the Under-Secretary for Transportation and Communications (Chairman); the Under-Secretary of Defense; the Under-Secretary of Education; the Under-Secretary of Natural Resources; the Deputy Commissioner of the Budget; and the Assistant to the Secretary of Community Development.

From the composition of the Presidential Committee it can be seen that the responsibility for the implementation of the school building programmes could be described as everyone's responsibility and, in this concept, pre-dated the highly successful programmes of Indonesia. Much of the detailed implementation was in the hands of the Army as this was the only agency that had the materials and facilities for constructing schools in rural areas—facilities that involved access by boat to sites on islands.

In the field, provincial sub-committees were set up to supervise the actual implementation of the programme. Each sub-committee was composed of the Division Superintendent of schools (Chairman), with the District Public Works Engineer, Provincial Community Officer and the Provincial Commander of the Philippine Constabulary as Members.

Realizing the urgency of the programmes, the committee adopted two systems of building pre-fabricated schools as a quick, easy and economical means of providing the required buildings. The pre-fabricated school buildings are of two types:

1. The 'Army' type, which is a two-roomed building, timber-framed, roofed with corrugated aluminium sheets and having a concrete floor. This type is used mainly in areas not affected by typhoons;
2. The 'Marcos' type—a two- or three-roomed unit. This type consists of a light-gauge steel frame, roofed with corrugated galvanized steel sheets. The walls are of hollow concrete blocks and the floor is of concrete. This type of building is suitable for use in the typhoon-affected areas.

In both cases the main elements were supplied pre-fabricated and are assembled on site. The materials procured locally by the community are sand, gravel, hollow concrete blocks and cement, although in some instances cement was also provided as part of the package.

Figure 1 shows a perspective view and the general construction details of the 'Army' building and Plate 2 shows one of the completed buildings.

FIGURE 1. 'ARMY'-TYPE BUILDING: CONSTRUCTION DETAILS

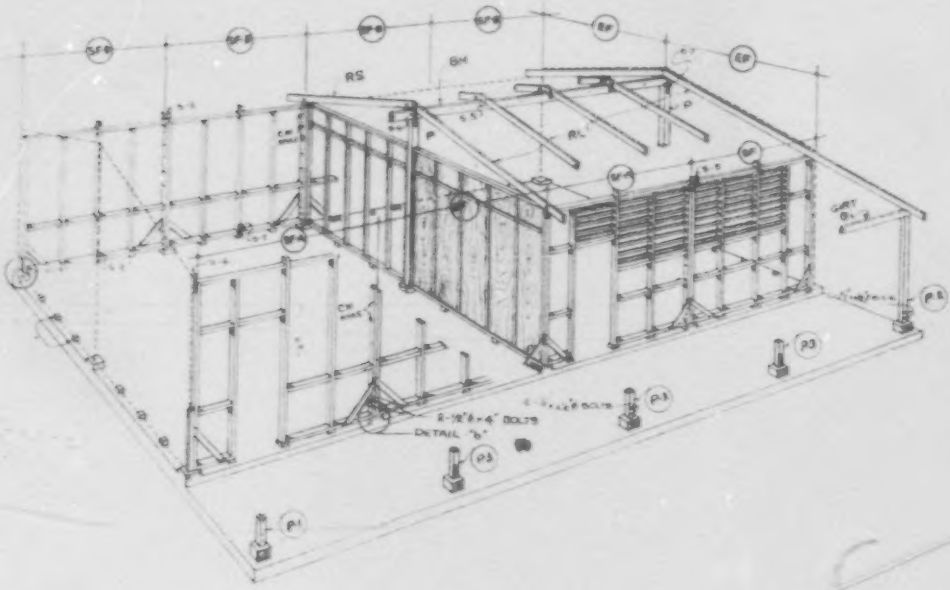


Plate 2. 'Army'–type school building

FIGURE 2. 'MARCOS'–TYPE BUILDING

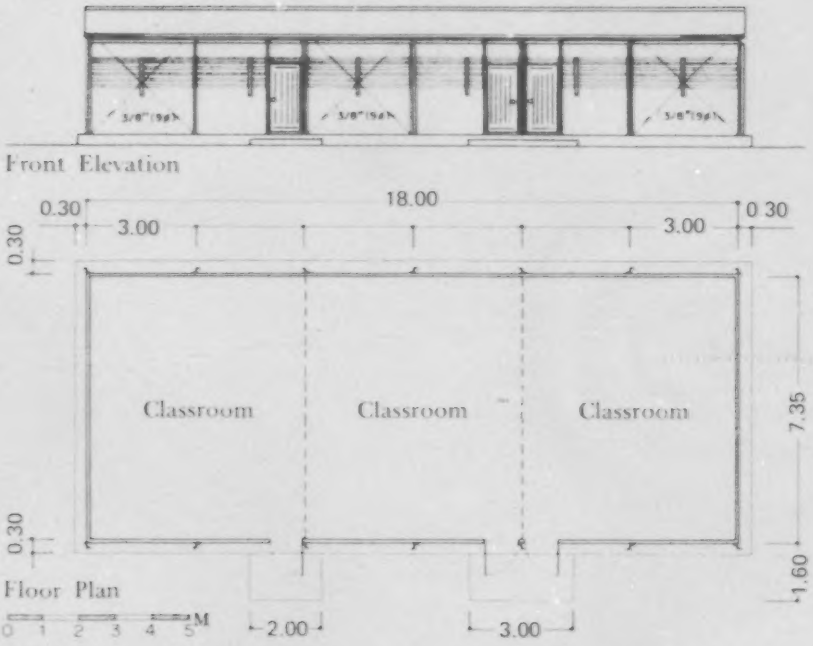


Figure 2 gives the floor plan and the front elevation of a 'Marcos' building unit, while Plate 3 (page 171, across) shows a building under construction. Detailed and well-illustrated erection manuals were provided and distributed to the sites, and using them, it was possible to erect the 'Marcos' building in seven days and the 'Army' building in 14 days. The average cost of the building at August 1971 was :

'Army' type, two-classroom unit	US $ 754.–
'Marcos' type, two-classroom unit	US $ 890.–
'Marcos' type, three-classroom unit	US $1,165.–

These costs do not include transportation and erection costs for the materials supplied by the community.

The ten-year school building programme 1976-1985

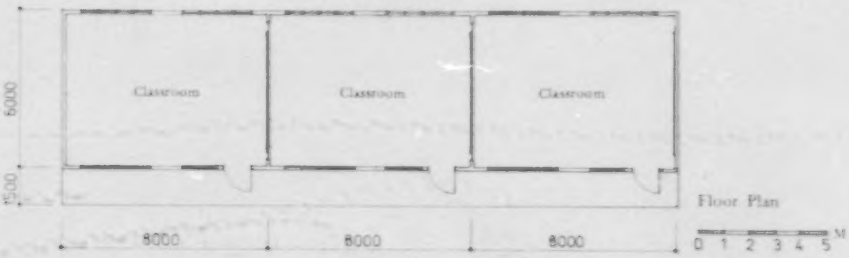
A new school building unit known as the *Bagong Lipunan*[1] type has been developed for this programme. It consists of three classrooms, each to accommodate 40 pupils. The building has been designed to withstand winds of speeds up to 230 km. per hour. Figure 3 shows the general plan arrangement and Plate 4 shows one of the early prototype buildings. The estimated cost of this three-classroom unit is about US $7,200 (₱ 52,500) or US $60 per place.

1. *Bagong Lipunan* means "new society"

Plate 3. A 'Marcos' type of school building under construction

The building has been designed by the Public Works Department (PWD) who will set up two plants to produce the component elements—the reinforcing steel, the roof framing, window frames, and the classroom furniture. The component parts will be packaged and delivered to the specific location complete with cement, fastenings and the roof sheeting. The labour and basic materials (gravel, sand, bricks) are to be provided locally.

FIGURE 3. 'BAGONG LIPUNAN'-TYPE OF SCHOOL BUILDING



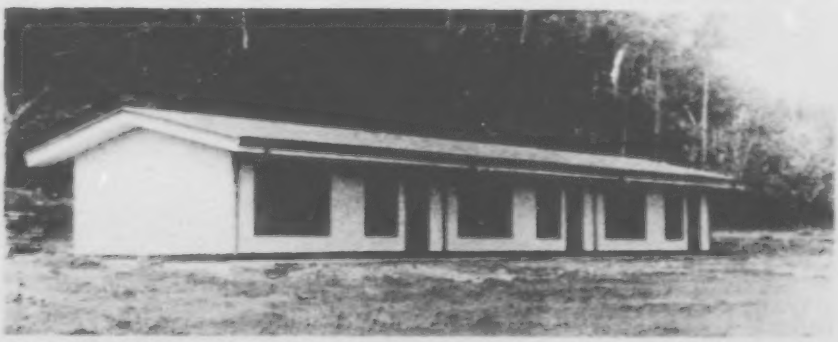


Plate 4. Prototype 'Bagong Lipunan' school building

When in full production, the two plants will have a weekly output of 40 units each and, to avoid stockpiling, deliveries will be made weekly. The District Education Supervisor has the responsibility of accepting the delivery of the packaged unit and the supervision of the construction of the building, while the assembly of the school equipment is the responsibility of the District Engineer of the PWD. Construction may be undertaken by either a building contractor under contract or by the local school administration, either of whom will employ the labour. The local community is being encouraged to participate, particularly in the rural areas.

In the case of vocational schools the buildings are usually constructed by the school administration with student labour as part of the vocational training. Supervision is provided by the architects and engineers of the Department of Education and Culture in co-operation with the Bureau of Public Works. Three agencies are involved in carrying out the programme:

1. The Department of Education and Culture, which is responsible for the allocation and location of the school buildings, the generation of continued interest among the community and feedback to the PWD for improvement in the design of the building and furniture;
2. The Bureau of Public Works, which is responsible for the design, production and transportation of the packaged components; the supervision of construction and disbursement of funds; monitoring and reporting on the progress of work to the Department of Education and the National Economic Development Authority;
3. The National Economic Development Authority, which is responsible for the overall co-ordination, and the formulation and implementation of the programme, monitoring the progress of the work and proposing budgetary adjustments to meet or increase construction targets.

The local community is responsible for providing the land for the school building, for providing resources for the improvement of the school and for providing additional facilities such as toilets, libraries, and the like. Also, governors of provinces and the city and municipal mayors are responsible for the provision of additional buildings to meet urgent needs which are not provided for in the ten-year programme, as well as the expansion, repair, and improvement of existing schools.

An annual target of construction of 4,000 school building units (12,000 classrooms) has been set, and at the end of the ten-year cycle it is anticipated that the backlog of primary school classrooms will have been reduced from 52,152 in 1975 to 20,765 in 1984. Judging by past performances, there is every reason to expect that this target can be met.

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SCHOOL BUILDING AND RECONSTRUCTION IN BANGLADESH WITH EXTERNAL AID

by Hafez Ahmed

Introduction

According to the 1961 Population Census of Bangladesh, the rate of literacy of the country was about 21.5 per cent; this figure included those who could sign their names only. Persons who had attended school beyond grade VI constituted only 4.5 per cent of the population. The situation did not subsequently improve to any extent owing to the high drop-out rate in the primary schools and the continuous population growth in the country at a rate of around 3 per cent per annum. Education in Bangladesh then received a set-back during the war of liberation, when most of the existing educational institutions were destroyed or damaged.

As the future prosperity of the country and its peoples is unlikely to be achieved while nearly 80 per cent of them remain illiterate, the Government of the People's Republic of Bangladesh has stated its objective of achieving universal literacy up to grade VIII; i.e. for the 6-14 year age-group of the population. This step itself requires the construction of a

Plate 1. The sheer lack of physical facilities may be said to account partly for the high rate of illiteracy in the area.

large number of new educational institutions, besides reconstructing the existing damaged buildings. With the limited economic resources it was not possible to venture on such a programme without assistance from external aid-giving agencies.

In early 1972, after the creation of Bangladesh, the United Nations International Children's Fund (UNICEF) which had been supporting the supply and child feeding programmes in the primary sector in the (then) East Pakistan, offered massive assistance to Bangladesh. This consisted of the supply of construction materials such as cement, reinforcing steel, corrugated iron and aluminium sheets, timber for the construction of furniture, and various other accessories for the building or repair of nearly 8,000 existing primary schools. Provision for the supply of basic teaching materials for 30,000 primary schools and 47 primary teacher training institutions and for a fleet of vehicles including microbuses, jeeps and motorcycles, was also made. The total UNICEF offer was for 8.5 million US dollars. The matching fund for implementing the programme—to be provided by the Government of the People's Republic of Bangladesh—was calculated at Tk. 42.30 million.[1] The agreement was signed in June 1973 and the terminal date for implementing the programme was fixed for 30 June 1974.

During the same period, the United States Agency for International Development (USAID) came forward with an offer of 5.9 million US dollars for construction/reconstruction of 2,000 high schools and 270 colleges. The agreement was signed in July 1973 and the terminal date was fixed at 30 June 1974.

Conditions under which aid was given

For the UNICEF Project for primary school construction and basic supplies (Plate 2), the following conditions were agreed upon:

1. UNICEF would import construction materials such as cement, reinforcing steel, timber, aluminium, corrugated iron sheets and basic supply kits. Delivery to the Ministry of Education was to be made at the ports of Chittagong and Chalna;
2. The Government of the People's Republic of Bangladesh would provide matching funds for transport of these imported materials to the respective school sites, purchase local materials and meet labour costs;
3. The Ministry of Education, Government of the People's Republic of Bangladesh, would be responsible for implementation of the Project;
4. The quality of construction work would be of a reasonably acceptable standard and this would be certified in the case of each

1. The unit of currency in Bangladesh is the taka (Tk.).

Plate 2. A typical rural primary school built as part of the UNICEF Project for primary school construction.

school by the field engineer, head of the institution and the Member-Secretary of the Sub-Divisional School Reconstruction Committee (S.D.S.R.C.). The work would also be checked by the aid-giving agency.

For the USAID secondary schools project, (Plate 3) the following conditions were agreed upon:

1. The entire cost of construction/reconstruction of the selected educational institutions would be borne by USAID;

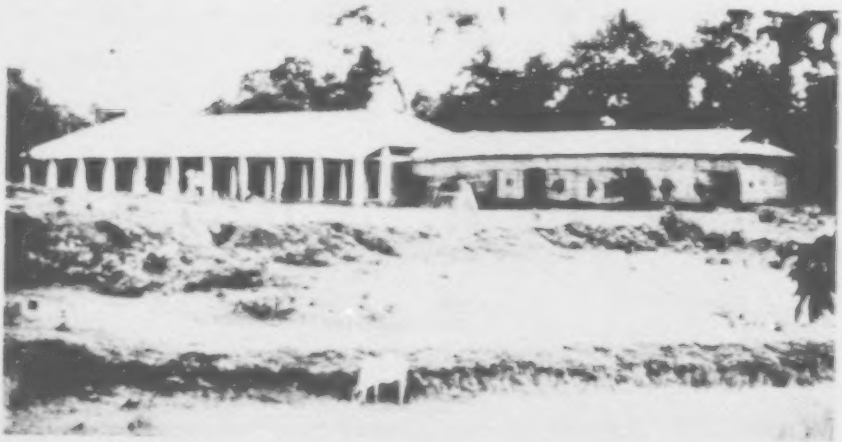

Plate 3. On the left, a typical rural secondary school built as part of the USAID Project for secondary school construction. Beside it stands one of the old schools.

2. Procurement of all construction materials would be the responsibility of the implementing agency;
3. Only non-governmental, private institutions would be covered under this programme;
4. The quality of work should be of a reasonably acceptable standard, and USAID specialists would make on-the-spot checks of each construction project.

Organization

The overall responsibility for the implementation of these two externally-aided construction programmes lay with the Ministry of Education; the Secretary, Ministry of Education headed the organization. The Chief Administrator and Executor of the two programmes was the Director of Public Instruction. The Director was assisted by a Deputy Director (incharge of implementation), an assistant Director (UNICEF Programmes) and other officers and ancillary staff. In addition to the Engineer Adviser, there were two executive engineers and 22 assistant engineers in the Sub-Divisions.

The Sub-Divisions were made the basic units for implementation of the Project, and 62 Sub-Divisional School Reconstruction Committees (S.D.S.R.C.) were formed (one in each Sub-Division). Each Committee consisted of ten members as follows: Sub-Divisional Officer (Chairman), District Education Officer, the District Inspector of Schools, an assistant engineer (Building Division), an assistant engineer (Education Directorate in the District), two teachers' representatives from the primary schools, two teachers' representatives from the secondary schools, and the Sub-Divisional Education Officer (Member-Secretary). The Sub-Division Committees were responsible for: the selection of schools according to the quota allotted to each Sub-Division, supervision of the surveys of the schools, storage of construction materials and their distribution to schools and, finally, disbursement of funds to the respective schools. The Member-Secretary worked as the main executive at the Sub-Divisional level.

Mode of operation

a) Selection. The Ministry of Education indicated the number of schools to be selected in each Sub-Division. This was done on the basis of the school population in each Sub-Division. The Sub-Divisional Committee selected the schools and forwarded the list to the Directorate;

b) Survey. The selected schools were then surveyed by assistant and sub-assistant engineers to assess the requirements for money and materials for each individual school. The survey reports, after being scrutinized by the S.D.S.R.C., were forwarded to the Directorate;

c) **Sanction.** The Engineer Advisor to the DPI re-examined the reports and gave final approval to the assessments of materials and money required for each individual school;

d) **Supply of materials.** The total amount of materials required for each Sub-Division was communicated to the Officer-in-Charge, Ports, who arranged to supply the materials to the respective Sub-Divisions through an approved carrying agent;

e) **Placement of funds.** The money required for purchase of local materials, transport of materials from Sub-Divisional Headquarters to the individual schools, labour and other costs was placed at the disposal of the Member-Secretary, S.D.S.R.C.;

f) **Funds and materials to schools.** The Member-Secretary of the S.D.S.R.C. supplied the materials to each school and the money required was placed with the Headmaster. The Headmaster was mainly responsible for managing the work on the technical advice of the field engineers. The field engineers assigned to each Sub-Division supervised the work and looked after quality control;

g) **Supervision from H.Q.** The Engineer Adviser, Executive Engineers, and the Deputy D.P.I. visited sites, supervised work and advised the field staff, as and when needed.

Problems

a) **Aid negotiation.** The offer of external aid is generally routed through the Planning Commission, Government of the People's Republic of Bangladesh. The donor Agency indicates the total quantity of aid it is prepared to give to the Planning Commission and the concerned Ministry;

The Ministry determines its needs and prepares the necessary scheme for approval by the Planning Commission. The Plan of Operation is prepared and signed by both donor and recipient Agencies. The negotiation of these two major school construction programmes in Bangladesh and preparation of schemes and Plans of Operation took about a year: this initial delay greatly affected the time schedule of the programmes;

b) **Procurement of materials.** In the case of construction of primary schools under the UNICEF Project, the materials were imported by UNICEF from abroad. Delivery started in early 1973, even before the plan documents were signed, and the flow continued with regular intensity. Clearance at the port, storage of materials at the port cities, onward transportation to Sub-Divisional Headquarters and the final movement of materials to the work sites took a long time; hence the actual construction work started far behind schedule. The procurement of timber was also a problem

for UNICEF, as the huge quantity required for the project could not be procured easily from the international market.

In the case of the USAID Secondary School Construction project, the construction materials such as cement, corrugated sheet and reinforcing steel were procured from the international market through the Trade Corporation of Bangladesh and the timber was imported from Malaysia. Delay in procuring the materials put this programme behind schedule.

Map showing the main means of travel – the river network

c) **Transport of construction materials.** From the stores at the port cities, the construction materials were carried to Sub-Divisional Headquarters by carrying agents appointed by the Directorate of Public Instruction. Sometimes carrying was also done by departmental trucks placed at the disposal of the Government by the UNICEF. Owing to the lack of good roads, (after liberation, the roads could not be restored to their normal condition for quite a long time), shortage of railway wagons and river boats, the transport of materials posed a big problem and was one of the chief factors responsible for delaying the completion of the projects. Transport of materials from Sub-Divisional Headquarters to the actual work sites was also very difficult. The available means of transport for this purpose were occasionally trucks but were usually bullock carts or boats, and these were also dependent on

Plate 4. Leaving one of the few paved road: for a track to a village is a bullock cart—one of the main means of transport for building materials.

Plate 5. Access to most areas of Bangladesh is by sailing barges which carry most of the supplies needed in rural areas, including building materials for schools . . .

seasonal conditions. It sometimes became really difficult to send materials to schools situated in remote villages;

d) **Selection and survey of schools**. The Sub-Divisional School Reconstruction Committees sometimes failed to make the selection of schools for construction or rebuilding promptly. The surveys of actual requirements of materials and money for the selected schools were done by the field engineers, and discrepancies in the determination of requirements were reported. These aspects were taken care of at a higher level and corrections were made, as and when required;

e) **Supervision**. The two programmes were spread over the whole of Bangladesh, mostly in rural areas, and strong supervision at every step was a prerequisite for successful implementation. Normally the construction of government institutions is supervised by the Ministry of Works but, as the primary and secondary schools concerned were all private institutions, the Works Ministry was not responsible for supervision.[2] The entire programme had to be organized by people who already had full-time commitments to their normal work and were thus only partly involved in the operation. Only the field engineers and a few ancillary staff were engaged at full time with the projects. Considering the large scale of both projects, a full-time organization with a Project Director as the head, would perhaps have been a more effective way of achieving timely execution of the programmes;

f) **Quality control**. Control of quality depended entirely on the supervising engineers, and on the management of the construction work by the headmasters of the schools. (Plate 6) Most of the field engineers appointed for these programmes were fresh from the Universities and Technical Institutions and did not have much background knowledge of actual construction work, although a short training course was provided for them. The headmasters of the schools were generally non-technical persons and could not contribute much to the quality control of the work, even though it was directly managed by them. The number of engineers appointed for field supervision was not enough in relation to the number of individual schools to be built and many engineers had to provide individual supervision to quite a large number of buildings. In some cases the work was not up to the standard required and had to be done again. Often a dearth of good bricks, sand and other materials, as well as of skilled labour, also hindered the work.

2. The primary schools in Bangladesh during the time of signing the contract were under private management but were subsequently taken over by Government with effect from July 1973.

Plate 6. Construction work is managed by Headmasters, assisted by supervising engineers.

Improvement and success

Owing to the problems and difficulties described in the foregoing paragraphs, neither of the projects could be completed on time. On 30 June 1974, the target date for completion of the secondary school project, only a few buildings were completed out of the 2,000 schools scheduled. USAID, the donor agency, indicated that the allotment for the project might be assigned to some other work and the secondary school project abandoned. The agency was ultimately persuaded not to take this course of action, however, and it was agreed that a reduced programme of 650 high schools should be constructed, the new target date being fixed for 30 June 1975.

A vigorous drive was made under the leadership of the then Education Secretary, together with the Director of Public Instruction and other officers comprising the team. As a result and despite many difficulties, the project was completed in time and today the students in 661 high schools constructed under the USAID programme are enjoying the benefits of these efforts.

On 30 June 1974, the target date for completion of construction work on the 8,000 primary schools for which UNICEF provides assistance, only about 200 schools had been completed. The target date was then extended to 30 June 1975. Because of delays in procurement of timber for the project and for other reasons, the date had subsequently to be extended again, to 31 December. At the time of writing, about 1,800 primary schools have been completed and all arrangements for completion of the remaining schools have been made. It may be mentioned here that the

target number of schools had to be reduced to 6,700 owing to rises in price of both local and imported materials as well as to rises in transport and labour costs. The original costs of the scheme were calculated on prices current in 1972.

Conclusion

In spite of the initial set-backs, the programmes were very fruitfully implemented in Bangladesh. The people are appreciative of the two projects, as they are complimentary to the Government's aim of achieving universal literacy. Being assured of success, UNICEF has again come forward to help Bangladesh on a large scale in its efforts to build up primary education on sound lines. UNICEF has already started to assist with the construction and renovation of Primary Teacher Training Institutes in Bangladesh and this will help the country substantially in training the teachers so vitally needed for the development of primary education. For the implementation of this project arrangements have been made keeping the past lapses and problems in view, and it is hoped that there will be fewer bottlenecks in future. Bangladesh, like other developing countries, is striving hard to achieve a high literacy rate. In order to achieve the aim, external aid is most welcome.

It is essential that, where external aid is used for school construction, a clear and precise plan should be chalked out before the endeavour starts. A strong organization with efficient and devoted people is a prerequisite for the successful implementation of any projects financed by External Agencies.

It may be added that, in addition to the two major school construction programmes discussed above, there are other school construction programmes, such as the International Development Agency's 260 Cyclone Shelter-cum-Primary school buildings and the CARE Programme for primary school construction. The I.D.A. project is supervised by the Ministry of Works and the buildings will be handed over to the Education Ministry to be used as primary schools and, in case of cyclone disaster, as shelters for those living nearby. CARE, Bangladesh, is implementing a programme for the construction of 40 primary schools in the cyclone belt. These are jute, plastic-reinforced buildings capable of resisting winds of up-to about 100 m.p.h. (Plate 7) It is hoped that CARE will be providing for the construction of more primary schools after the first phase, when the 40 new schools are successfully completed.

Recommendations for future aid programmes

For efficient and early implementation of the projects of this type in developing countries, the following suggestions may be made:

1. Negotiations with aid-giving agencies should be finalized within the minimum possible time and the concerned Ministries of the

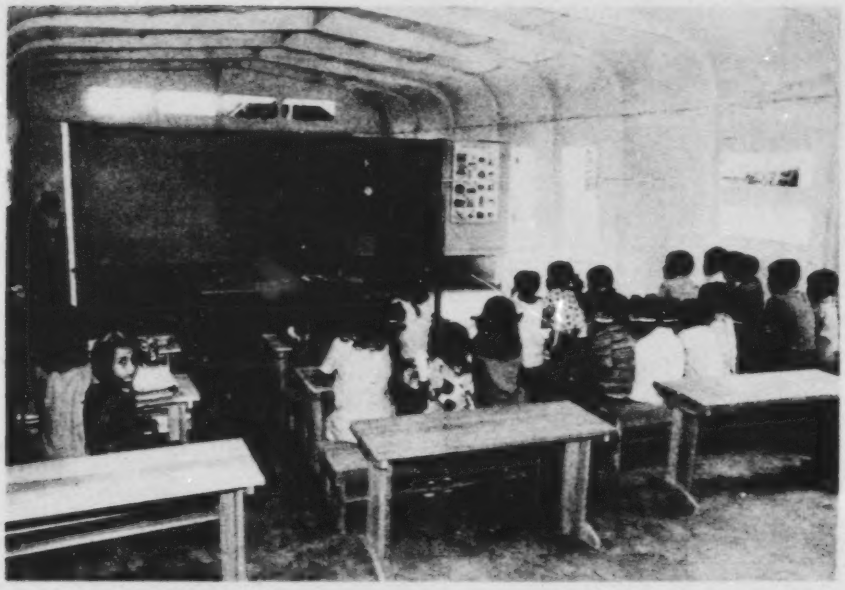

Plate 7. Interior of a jute-reinforced plastic school for cyclone-affected areas, provided by CARE.

aid-receiving Government should have well co-ordinated programmes for this purpose;

2. The volume of aid should be in conformity with the absorptive capacity of the aid-receiving Government;
3. Construction materials should be procured locally as far as possible so that massive transportation operations may be avoided;
4. For efficient management of the programme, an organizational set-up should be established before the programme is begun. The organization should have managerial as well as technical personnel and be headed by a Project Director;
5. Field supervisory staff should be experienced and dependable so that quality control may be effected properly;
6. For efficient clearing and carrying of materials from the ports to the interior, some relaxation may be made in existing government rules so that renowned and capable firms may be available for this purpose;
7. The flow of finance should be assured for efficient management of the programme;
8. Supervision at all levels should be efficiently organized.

BANGLADESH: NUMBER OF SCHOOLS CONSTRUCTED OR RECONSTRUCTED AND MATERIALS AND FUNDS UTILIZED

High schools (USAID Project)	No. of schools
Total number of high schools on which work was undertaken	661
New units (50' x 20') with 28' x 7' verandahs, permanent construction	70
Semi-prototype units (50' x 20') with 5' brick walls and corrugated iron sheet roofing, with verandahs	95
Schools reconstructed or repaired	496
Furniture (20 high benches and 20 low benches, each 6' 8" long, per school)	591
Furniture—laboratory furniture—sets	70

Materials used:

Cement	3 200	Tons
Corrugated iron	338	"
Reinforcing steel	370	"
Timber	3 480	"

Funds spent on transport, local materials, labour and other expenditure	US $1.61 million
Approximate cost of material	US $1.73 "
Total (approximately)	US $3.34 "

Primary schools (UNICEF Project)	No. of schools
Total number of primary schools on which work was undertaken	7 660
New units (50' x 20')	2 981
Existing schools reconstructed or repaired	3 657
Supply of furniture (including 1,022 schools where only furniture will be supplied)	7 660

Materials used: (imported by UNICEF)

Cement	6 750	Tons
Corrugated iron sheet	990	"
Aluminium sheet	850	"
Roofing accessories	80	"
Timber	15 500	"
Reinforcing steel	510	"

Funds spent on transport, local materials, labour and other expenditure	US $ 5.30 million
Cost of imported material	US $ 5.50 "
Total (approximately)	US $10.80 "

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DECENTRALIZATION OF EDUCATIONAL BUILDING PROGRAMMES

by Premadasa Udagama

Education in the traditional Asian society relied on a teacher and pupils for the oral transmission of knowledge. The shelter required for this teaching/learning process could be the shade of a spreading tree, a place of worship or some other building that was available for community activity. Except for the many ancient institutions of higher learning with their often imposing facilities, buildings for school education appeared first—in many countries of the region—only as part of the colonial tradition.

After the Vasco da Gama period of Asian history, the Western missionaries introduced an educational tradition which differed but little from the earlier indigenous religious traditional education, except in that it was accomplished in a changed, constructed environment. The new school buildings were essentially based on the western architectural model and served to develop an elitist educational tradition, as well as to impress upon the masses the imperial might and power. The early colonial educational facilities were usually located in urban centres and very rarely appeared on the rural scene away from the centres of power and trade.

It is not necessary to dwell at length on the fact that educational philosophy influences school building design and that, in turn, the building themselves have an influence on the total school curriculum. The very purpose of colonial education was to wean its recipients away from the people, from their society, their traditions, culture and language. The creation of a native elite to service the imperial power structure and its machinery was an essential characteristic of this colonial education.

In the era of independence that emerged in the wake of World War II, the 'new' Asian societies expressed a demand for education unprecedented in their social history, and most governments of the countries of the region set about planning the provision of basic education for all, with special emphasis on the rural areas. Achievement of this objective of basic education for all meant, however, the provision of some sort of school building in every rural community and this in turn required not only heavy capital investment, but the organization of construction programmes in

often remote places of diverse geographical conditions—from high mountains to typhoon-prone littoral areas; from deserts to humid, equatorial forests.

Breaking away from an educational system designed for the elite has been a painstaking process for many Asian nations and the conversion of these systems to new systems designed to provide education for the masses has not yet been fully achieved in many countries. This may be because some education authorities themselves are not convinced of the need for change except to impart as literacy Paulo Freire's "silent language of the masses."

Administrative problems

In a region as vast as Asia, a variety of systems of administration and administrative practices prevail. While every country has had to expand its educational facilities during the past two decades and, moreover, to pay attention to equitable geographical distribution, the traditional centralized forms of administrative organization continue to hold up the provision of school buildings.

Of course, one of the common constraints to the provision of more schools is the limited financial resources available for education. In most countries, capital expenditure on buildings is minimal as teachers' salaries vie for increasing allocations from the education budget. School lotteries, private munificence and collective community effort are no substitute for a national plan assigning priority to school construction. In some countries, no local taxes are set aside for the support of schools, while in others the central, regional and local governments sometimes join together with school management authorities for support of building programmes. At any rate, whatever course of action is followed, the financial constraints will hold back the provision of educational facilities for many more years and, even then, the most that is likely to be afforded will be the construction of simple classrooms.

While the structure of the system of educational administration usually reflects the form of the political administration in each country, it seems that, whatever form the political administration may take, some decentralization or devolution of administrative power is inescapable if facilities are to be provided in the rural areas. This is especially the case where education is to be organized on the principle of using the environment for teaching and learning. Environment-based education should lead to closer contact between the school and the community, evolving greater relevance in education for living in the rural environment.

Yet it is rare to note emerging trends of district or community-based planning in education; hence, in school buildings, the specific local background of the sub-society or sub-culture is rarely reflected in the design. If this were to be achieved, peoples' participation in their own and in their

children's education would be an easy matter. The government agency at the centre or in the regional capital may be more concerned with regulations on space per student, with regulations on material prices, transport and other matters. These concerns are often such that neither materials nor money reach the sites in time and buildings are thus lost forever to the local community.

Many are the government financial regulations which hamper school building construction in the countries of the region. One major obstacle is often that the construction of schools is the responsibility of a department over which the education authority has no control. There are, in some countries, old audit rules which stress the control of money but neglect the protection from the weather and other destructive forces of construction materials purchased with government funds. Rules which require the expenditure of budgetary allocations within a fiscal year often create insuperable difficulties for construction programmes in remote rural areas for, by the time sites have been selected and the foundations laid, the year has run out and no more money is available to complete the building. Another source of difficulty is that payments to contractors are often delayed, which discourages them from entering into new construction contracts in the area.

There are further barriers to the construction of rural schools. Building specifications are prescribed in manuals and regulations issued by the central authority. These specifications are mainly urban-oriented with regard to the materials to be used. Moreover, the specifications tend to ignore the restrictions on imported materials and the probable foreign exchange shortage facing the particular country. Often the rigidity of the specifications creates much tension between officials supervising their implementation and the contractors responsible for construction, resulting frequently in unnecessary delays.

Finally, political interests often play an important role in determining the provision and distribution of educational facilities in a country and this, in the absence of proper plan for the location of schools, sometimes leads to inconguous situations. It is not unusual, for example, to find expensive secondary school buildings located in centres of rural poverty, ostensibly for the purpose of improving education. In some cases, there are not even enough students in the area to occupy such schools, and the buildings and the institutions within them are alienated from the people.

Agencies for school building construction

School building is undertaken by a variety of agencies in the countries of the Asian region. Happy is the situation where this work is the responsibility of the building-engineering section within the education system itself. More commonly, the Education Ministry or Department

has to rely on the Public Works Department to undertake its school building programmes. While the Public Works Department is usually capable of handling large-scale construction programmes in and around the towns, it may be less well able to undertake the construction of a few classrooms in innumerable rural areas, as the overhead charges on such small capital outlays will make the work an uneconomic venture. Hence, the rural areas having the greatest need for buildings tend to be the most neglected.

The situation may be improved, however, when technology of a certain order is fairly common in the country. Then the rural co-operative societies, parent-teacher associations and school welfare societies may undertake school construction programmes themselves. Funds for such programmes may come from the community or from central or local government. Construction undertaken by local organizations of the sort listed above has both inherent advantages and disadvantages. Being part of the community, local societies are intensely concerned with the welfare of their schools and will usually undertake construction work as a service to the community and without profit. They will tend, moreover, to keep costs down by using free labour provided by parents and children and, within their competence, will try to provide a good building. Sometimes, however, they may not have the technical knowledge needed to construct the building designed by the education department architects. Supplies of building materials of the quality and quantity specified may not be readily available. Transport difficulties may make the cost prohibitive, and the design may be such that the cost of building is not within the capacity of local rural organizations.

In many countries of the region, the construction agent is usually the building contractor. Because of their entrepreneurial skills, rural contractors seem to undertake many kinds of constructional operations. Through experience, they gather the expertise to operate in any area and they also usually have financial support. As a business venture, however, contracting has as its objective monetary gain, rather than community service, and this leads to friction between those supervising the contract and the contractor over matters such as the materials used and the quality of construction. Contracting under this arrangement can also lead to corruption.

Nevertheless, there are some aspects of school construction for which the expertise of a contractor is nearly always essential. These include the provision of a piped water system and of sanitary facilities. The supervision of such work in rural areas will always present a challenge.

This being said, the over-riding problem in the provision of educational facilities to rural areas is probably the lack of understanding on the part of the school authorities of the importance of the relationship between the buildings and the curriculum—a relationship that has to be established if efficient and functional school buildings are to be provided with economy and expediency. Until quite recently, relatively few

education authorities, especially the ministry officials and school principals, were aware of the requirements with regard to teaching and learning. Teachers, meanwhile, seemed neither able to communicate their needs to the building designer nor was the designer able to understand the many-faceted requirements of educational institutions. The opening of the Unesco-sponsored Asian Regional Institute for School Building Research in Bandung (subsequently transferred to Colombo) was of some significance in drawing the attention of educationists and designers to the designing of educational buildings and facilities. School buildings needed to be looked-at in a new dimension,and the various research papers published by the Institute, together with its seminars and training courses showed the fundamental importance of the links between the curriculum and those aspects of design concerned with the comfort and well-being of the students.

Building and expertise in the rural sector

When authority is decentralized in educational operations, all types of experts and specialists will be required to man district-level offices in the rural areas. This poses several problems. First, only limited numbers of architects and quantity surveyors are available in the Asian region and, in the rural areas, even building supervisors are quite rare. Second, the rural principal will be as unfamiliar as most others in a rural community with the technique of communicating his specialized requirements to a building designer.

To convert an institutional design into a building programme is also no easy task. If co-ordination of the process of construction is not organized in relation to the supply of labour, materials and construction, delay is bound to occur and this may well add to the costs of the building. Indeed it may be difficult to translate building plans into finished construction unless experienced, middle-level personnel are available on the site.

Financial management is another area in which parent-teacher associations, co-operative societies and other organizations may need help and guidance. Loans from banks may not be readily available, unless the banking or credit system is well established.

A common problem encountered in countries which have a large stock of existing schools—such as Sri Lanka—results from the absence of proper development plans for individual institutions. When buildings are constructed on existing school sites to meet the need for the increasing school population, the resulting complex of old and new buildings is frequently not only difficult to manage and supervise, but is likely also to be uneconomically used even though it may not be displeasing to the eye.

A complete school can use a wide variety of spaces to make the curricular programme complete and practical. These may include special

rooms, laboratories for science, home economics rooms, agricultural units and other spaces demanded by the programme. In addition, there is a need for other facilities such as teachers' rooms, offices, a library and, especially in the rural areas, provision for a canteen. Unfortunately, the tendency in rural schools is to neglect planning for these facilities and to provide simple classrooms of a standard size—even though the grade-to-grade enrolment rarely justifies this. The urban school continues to be a model for rural schools, although the stress is now on rural uplift and development.

In any case, new ideas take time to reach the clientele of the schools in rural Asia. The end result is that the poorer the area, the rarer will be the educational opportunity for the rural child. It is tragic when the rural community does not obtain value for the money, energy and enthusiasm that it has built into its schoolhouse; the rural school building remains the symbol of a process that is an inevitable prerequisite for the development of the Asian people in this period.

The great need in Asian education systems is to provide low-cost, functional school buildings put up with local material and human resources. They should merge with the local, natural and human landscape as their curriculum should serve the community needs. A construction programme that is designed to merge these elements with elegance, economy and harmony needs greater numbers of experts than we have at present. It also needs more money than is usually provided for the purpose.

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EDUCATIONAL BUILDING DESIGN IN THE CONTEXT OF ARCHITECTURAL EDUCATION

by Balwant Singh Saini

Tropical architecture in the post-war era

Institutions of architectural education must assume the responsibility of training future professionals who have the ability to design and construct school buildings which are in sympathy with their country's social, economic and traditional requirements. Before this issue is explored in any significant way, it may be useful to recapitulate briefly the background of the architectural profession, the way it has grown and the nature and extent of architectural education and training in this part of the world.

Until the end of World War II, most of the developing countries suffered a colonial status whose destinies were governed by a handful of metropolitan powers. During the last three decades they have emerged as independent nations. This in turn has resulted in large-scale developmental programmes and consequent building activity. In this initial flush of self-government—and having achieved a national identity—leaders of many of these countries spent enormous amounts of money and resources to build expensive buildings such as luxury hotels, and extravagant public structures as monumental symbols of their newly acquired status.

Owing to the absence of local architects, builders, engineers, and planners, moreover, a substantial part of this activity was controlled by professionals whose background and experience was essentially European. The achievements of Le Corbusier, Maxwell Fry and others are well known. They had a vision and commitment which distinguished their work in countries as far apart as the West Indies, Malaysia, India, Nigeria and Ghana. Because of their lack of thorough understanding of climatic and other problems, however, they also made many mistakes, often quite serious in failing to meet the climatic and geographic conditions as well as the needs of the people.

As a result, cities in many developing countries around the tropical belt are littered with expensive buildings *which have large window areas of glass in climates where heat-load is enormous and where sun is an enemy as well as a friend.* Lacking awareness of local materials, climate and other social and cultural factors, these buildings are often forced to rely on expensive mechanical equipment to make them liveable.

Training local architects

It soon became obvious to everyone that a sound educational programme was needed for training local architects who would be more familiar with local problems and who would also be sensitive to local culture. The need for such a programme was realized fairly early but, somehow, plans for establishment of local schools of architecture did not get off the ground until during the last few years. This meant that for nearly twenty years, local architects had to go either to European or North American tertiary institutions to learn their profession.

Although the training given was basically sound in many respects it still lacked a curriculum which specifically focused on problems faced by the architects-to-be in their own countries. After their return, many of them continued to make the same mistakes as their European counterparts by transplanting European forms of building in their local settings. They also found that much of the expertise they had learnt while overseas could not be easily applied to problems at home. There was urgent need to research and investigate many new problems not encountered before. In the meantime, the emphasis on building had also changed. In contrast to earlier days, the leaders and policy-makers had also realized that developing economies could not sustain extravagant structures of the kind built during the late 1940s and 50s. It was important to pay greater attention to building for health, housing and education, designing structures which would ultimately help to improve the environment and living standards of the majority of people who for generations had been victims of poverty and degradation.

To overcome the deficiencies of undergraduate architectural training, some attempts were made to provide specialized education at a post-graduate level. Among a number of institutions which generally looked into planning and building problems of developing countries, two specifically concentrated on problems of tropical building. The Department of Tropical Studies, which is now defunct, operated for many years within the Architectural Association School of Architecture in the United Kingdom. It was established in 1953 as an outcome of an international conference on tropical architecture and it started with a post-graduate course for students from tropical countries and for English architects intending to work in the tropics.[1]

In 1962 the University of Melbourne established a post-graduate course in tropical architecture which offered facilities for a formal one-year research programme leading to a masters degree geared to meet the needs of a practising architect.[2] The projects associated with this Course

1. Architectural Association. School of Architecture. Department of Tropical Studies. *Information booklet.* London, 1965. 25 p.

2. Melbourne, University. Faculty of Architecture. *Handbook.* Melbourne, 1968. pp. 60–61.

were generally interdisciplinary in character, and field work in tropical regions was considered essential. This post-graduate course is no longer operating at Melbourne but, in a modified form, is now offered as an important segment of graduate and post-graduate studies at the University of Queensland.[3]

Architecture schools in developing countries

During the last ten years a number of new schools of architecture and planning have been established in many parts of the 'developing' world. Already, there are fourteen in India, one in Burma, three in Malaysia, one in Singapore and a dozen or so in Indonesia and the Philippines. Recently, the University of Technology in Lae, New Guinea, established a full-time course in architecture and building which is the first of its kind in the whole of the South-West Pacific. The course concentrates on problems of building encountered in the island territories.

During a recent visit to a number of schools of architecture in South-East Asia, it was heartening to find that the curriculum of most of them is no longer confined to the study of problems of expensive office and housing blocks. There is an increasing emphasis on design and construction of low-cost housing, schools and health centres. While most schools provide a good cross-section of all building types, there appears to be no single school of architecture which provides exclusive training in school building research, design and construction. This is understandable since the students of architecture must be exposed to the whole spectrum of building activity in their regions.

There is a good case, however, for instituting programmes in which staff and students are involved in assessing educational facilities in their own areas and suggesting ways and means to improve them. Such programmes are often beyond the resources of private architects and the Government Departments who have neither the time nor the manpower to perform such tasks. Architecture students, if involved, can provide a valuable source of enthusiastic workforce and would welcome the opportunity to do something which might ultimately benefit their community as well as provide them with an excellent vehicle for learning. This approach is effective, as the following two examples from Papua New Guinea and Australia indicate.

New Guinea University of Technology

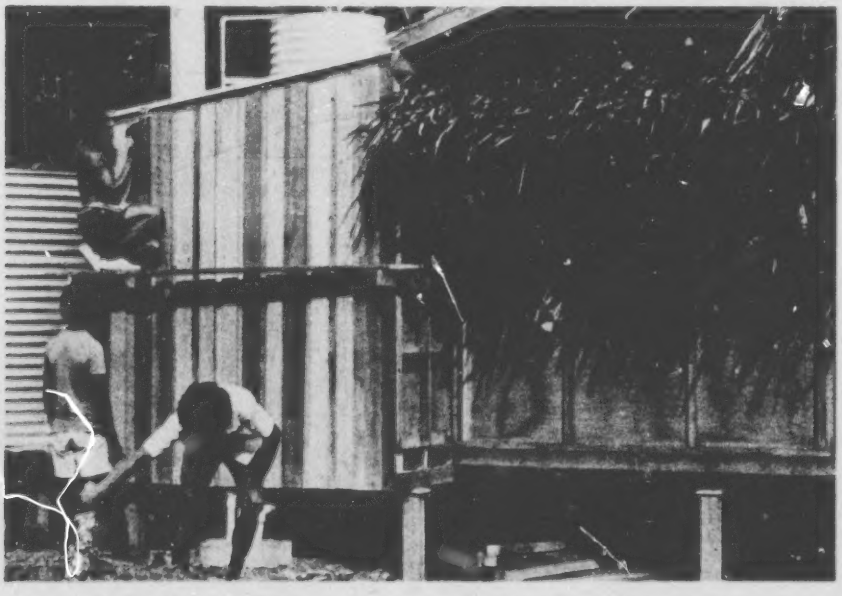
Like many other nations in this part of the world, the newly independent country of Papua New Guinea has limited resources, but its leaders are anxious to increase productivity in the shortest possible time. Teaching and research activities of the University of Technology at Lae are rightly geared to problems which are realistic and have direct relevance

3. Queensland, University. Department of Architecture. *Handbook.* Brisbane, 1974. 97 p.

to that country's development. This is being done in a number of ways, one of which is to combine them with programmes of community development. As a recent report points out, Lae University's community development work offers excellent opportunity for staff and students to make a worthwhile contribution to the planned growth of the country. It strengthens bonds of understanding and sympathy with the villager and urban settlement dweller, and helps to keep in touch with development problems at the grass roots.[4]

In these projects at Lae, students of architecture and planning have played a prominent role. A large part of their work is associated with educational buildings. Their programmes include preparation of guidelines and building of schools and teachers' accommodations which pay special attention to the needs of teachers and students in remote areas of Papua New Guinea. Other examples include a "Carvers Village", ideas for which have been developed by some fourth-year students for construction within the grounds of a local technical college. Another group of more junior students have been involved in redesigning and improving a number of primary schools which are especially suited to the needs of young children by providing playgrounds, nature strips, climbing towers and other play areas designed and constructed by students themselves.

Plate 1. A prototype model for teachers' accommodation in Hobu Village using some local materials.



A. Boddy

4. Papua New Guinea University of Technology. *Report on community development work 1971–1973.* Lae, Community Development Committee, 1974. 12 p.

A. Boddy

Plate 2. Working out a design for teachers' housing at minimum cost yet adaptable to local conditions.

One way to describe the activities of this University in Lae is to quote directly from its "Community Development Newsletter", in which a senior architecture student, Sandy Kelly Kagl, has described how he and another student helped to assist The Wambip Community Education Centre in the Highlands of New Guinea.

> . . . Ove Oakai and I, both Fourth-year Architecture students, made a trip to Mendi by plane to collect information on the site conditions of the proposed centre . . . During our period of temporary residence at the /Wambip Centre/ we gathered geographical and physical features of the site and surrounding areas. Furthermore, a few interviews were conducted between concerned members of the Wambip Community and with Dus Mapun. The accumulated information was intended to satisfy the designer's questions when he is designing the Community Education Centre. We visited some of the neighbouring villages and witnessed a Catholic baptismal service and a traditional evening social activity—'turning heads'. This was to familiarise ourselves with the social activities of the area under study.
>
> The general conclusion we drew up from our interviews was that the people were ready to move in and put up the building to be built of predominantly local materials. There will be very little money involved and the people will be encouraged to work by themselves. Dus Mapun mentioned that the building will initially be constructed out of local

materials and only when people appreciated the usefulness of the centre would he recommend different permanent building materials wherever appropriate.

The aim of our trip to Wambip was to collect site condition information and make design proposals for the Education Centre. This objective will be achieved as soon as possible and it will be conveyed to Dus Mapun to present to the people. If the designs are accepted and the building gets built, we would probably pay another visit to the area later in the year.

Similar pilot projects will be established in Kavieng, Kainantu, Tubusercia Village and Minj. Architecture students from different years ranging from 3rd to 5th year will be involved in these and they would need to travel to the sites, gather information, and speak to the clients. This is a good scheme as far as the Architecture students' profession is concerned since he is required to collect site condition information prior to commencing any design work. On the other hand, the information that is fed back to these people in the form of building designs will be a greater contribution towards the promotion of Community Education Centres and the general Rural Development Schemes of the government of Papua New Guinea.[5]

Research in the University of Queensland

The second example is from work done in the Architecture Department at the University of Queensland. Under the direction of Mr. Ian Sinnamon, students and staff conducted a series of projects for Unesco. The aim was to conduct a survey of educational facilities in Australian communities. They collected comparable data about educational innovations involving the community in planning, establishing, operating and using educational facilities.

This study was designed in two phases: the first involved a collection of literature on the subject as it exists in Australia, and researching and documenting in detail the situation in as many existing examples of such schools or facilities as possible; the second phase involved the study of a community where such an educational facility could reasonably be proposed, and the design of detailed proposals for its establishment.

The survey group found that there were many examples of so-called 'community schools' in Australia, most of them serving, or being run by upper-middle-class groups. It also appeared that a major function served by such an educational system involved integration of a community

5. Papua New Guinea University of Technology. *Community Development Newsletter*, Vol. 1, No. 1, April 1974. pp. 4–5.

across barriers of age, occupation and status. The students then thought it desirable to look at a range of 'community' situations in order to get a spread of data. By doing this they managed to avoid some of the dangers inherent in generalizing from 'middle class' experience.

When the community-based educational facilities were investigated they included a new town development plan for the urban fringe; integration of existing facilities in an old and run-down area of South Brisbane; an urban facility primarily serving disadvantaged aboriginals; and two settlements serving almost exclusively aboriginals—one western technology-oriented and the other more specifically geared towards traditional aboriginal culture.

None of the schools of architecture in the Asia and Pacific region seem to be active in post-graduate research at present, but this could well emerge in the next few years after the under-graduate courses have been properly established. In the meantime, investigational work relating to school building design and construction will have to be done at the tertiary institutions in comparatively more affluent countries within the region such as Australia, New Zealand, Singapore and Japan. An example of the kind of work which such Institutions are able to do is an investigation carried out by Chew Chee-Sun, a graduate of the University of Melbourne.[6]

Plate 3. Members of the staff of the Department of Architecture at the University of Queensland examing a model of an Australian school building.

D. Simpson

6. Asian Regional Institute for School Building Research, Colombo. *Anthropometric data for students in the territory of Papua and New Guinea.* Colombo, 1971. 61 p. (Occasional Papers – School Building no. 14)

D. Simpson

Plate 4. Students of architecture analysing the results of the survey of innovations in educational building which have involved the respective communities in their achievement and use.

Chew assembled anthropometric data of students in Papua New Guinea. He studied the body sizes of children in order to help improve the quality of information available to those responsible for designing schools and school furniture. His research was the first of its kind in the Pacific region.

Earlier researches conducted by Unesco in South-East Asia had established that Asian children are approximately 12 per cent smaller than European children of the same age groups and that, because of this, most of the school furniture in use in that region was far too large for comfort. Chew's figures have indicated that children in New Guinea are generally larger than those in Java and the Philippines and are only 6 per cent smaller than their European counterparts.

This survey, which was later published by the former Unesco-sponsored Asian Regional Institute for School Building Research in Colombo, Sri Lanka, has already been studied by architects associated with school buildings in New Guinea, and a furniture designer has been involved in developing prototypes for local manufacture, an operation which is closely associated with the training programme of local corrective institutions.

The most important lesson offered by the above examples is to emphasize the need for a rational design approach based on a thorough scientific understanding of the local conditions. Such an approach is particularly urgent since the economies of many of these countries are unable to support expensive solutions.

Bulletin of the Unesco Regional Office
for Education in Asia
Number 17, June 1976

THE DESIGN OF EDUCATIONAL BUILDINGS BY PRIVATE ARCHITECTS IN SINGAPORE

by Alfred H.K. Wong

Introduction

This article is intended as a brief survey of some of the most recent educational buildings in Singapore that have been designed by private architects. It discusses the general processes in the development of a new school and focusses on the problems of planning and design. The article concludes with a description of some of the new educational buildings—illustrating with photographs those that are complete. Those nearing completion are illustrated with drawings.

Background to the non-government schools in Singapore

There are a number of Christian Mission Schools which date from early colonial days. Many of them received government aid in the past since they were complementary to the government schools in providing education to the local residents, using English as the medium of instruction. At the same time, schools using the Chinese and Indian medium were actively supported by their own cultural or ethnic groups.

At the present time, both the Christian Mission schools and the other private schools receive financial aid on a dollar-to-dollar basis for new buildings as well as for extensions to existing buildings. As far as private practising architects are concerned, the private schools form the clientele for new school buildings.

These schools are administered by their own staff and have a School Management Committee which is responsible for raising funds, arranging scholarships and generally providing the link between the Ministry of Education and ancillary agencies such as Parent/Teacher Associations.

School Management Committees also take an active part in decisions regarding sites for new schools which are selected in consultation with the Ministry of Education. Decisions as to the selection of architects also appear to be the prerogative of School Management Committees and they, together with the Principal of the school, represent the client to private architects working on school building projects.

General processes in the development of a new school

When the building of a new school is contemplated, the school administration, together with the Management Committee, opens a dialogue with the Ministry of Education, beginning with the suitability of the site in relation to the density of population and any existing facilities. The dialogue is maintained for the development of the architect's brief or instructions, determining the size and the type of facilities to be provided and estimating the resources required for the project.

When agreement has been reached, authorization is given for the preparation by architectural firms of plans which, together with estimates of cost, are submitted for obtaining financial aid from the government. The practice has been for such aid to be up to a limit of 50 per cent of the total and, in the case of the new junior colleges, which will be described in outline in the following paragraphs, the government has also provided suitable sites which were offered on the basis of a long lease to the schools concerned. It is of interest to mention that, with the prevailing land prices in Singapore, purchase of a site for a new school or a junior college is prohibitive in cost and is one of the reasons why many of the non-government schools have remained in their existing premises with occasional extensions when additional facilities are needed.

With the 50 per cent subsidy from the government as a capital grant, the other half of the building costs are raised from the general public by the school and the Management Committee. Thus all new school buildings in this category represent a joint effort of both the private and public sectors.

The architect's brief reflects, therefore, a combination of the pedagogic philosophy of the school concerned, integrated with requirements which are detailed by the Ministry from time to time. Within this framework, the architect serves not one but two clients in having to satisfy the combined requirements before any school project may be implemented.

With the present high cost of operations as compared to the amount of school fees collected (at the rate of US $0.80 per primary school student and US $2.40 for secondary school students, per month) nearly all non-government schools have become government-aided schools. According to 1972 figures, there are only 12 entirely private schools as compared to 229 government-aided schools.

Problems in the planning and design of educational buildings

In common with many other building types, the main problem in the planning of educational buildings is the difficulty in arriving at the architect's brief. This is usually produced by the principal of the school and his team of teachers and some members of the School Management Committee who form the 'lay members' in the group.

To understand the immensity of such an undertaking, it must be borne in mind that preparation of the brief has to be done concurrently with the full-time occupation of teaching. In addition, the work by its very nature is an *ad hoc* activity, as the committee undertaking it only operates when the idea of a new school is being developed. Taking into consideration the fact that, in the history of a typical school, there is likely to be only one new school building proposed, it can be seen that the pressure on such an *ad hoc* Committee to meet the requirements of the teaching staff requires the exercise of not only good judgement but considerable diplomacy.

It is of interest to compare this with the case of government schools which are under the direction of a Standing Committee within a department whose sole interest is to oversee the development of new schools.

In general, it might be desirable that some form of specific guidelines be laid down by educationists in the Ministry so that both the School Management Committees as well as the architects of the project can have some basic terms of reference in the planning of new schools. A certain amount of time would then be saved in the development of the brief which has still to be undertaken by the Committee together with the architects.

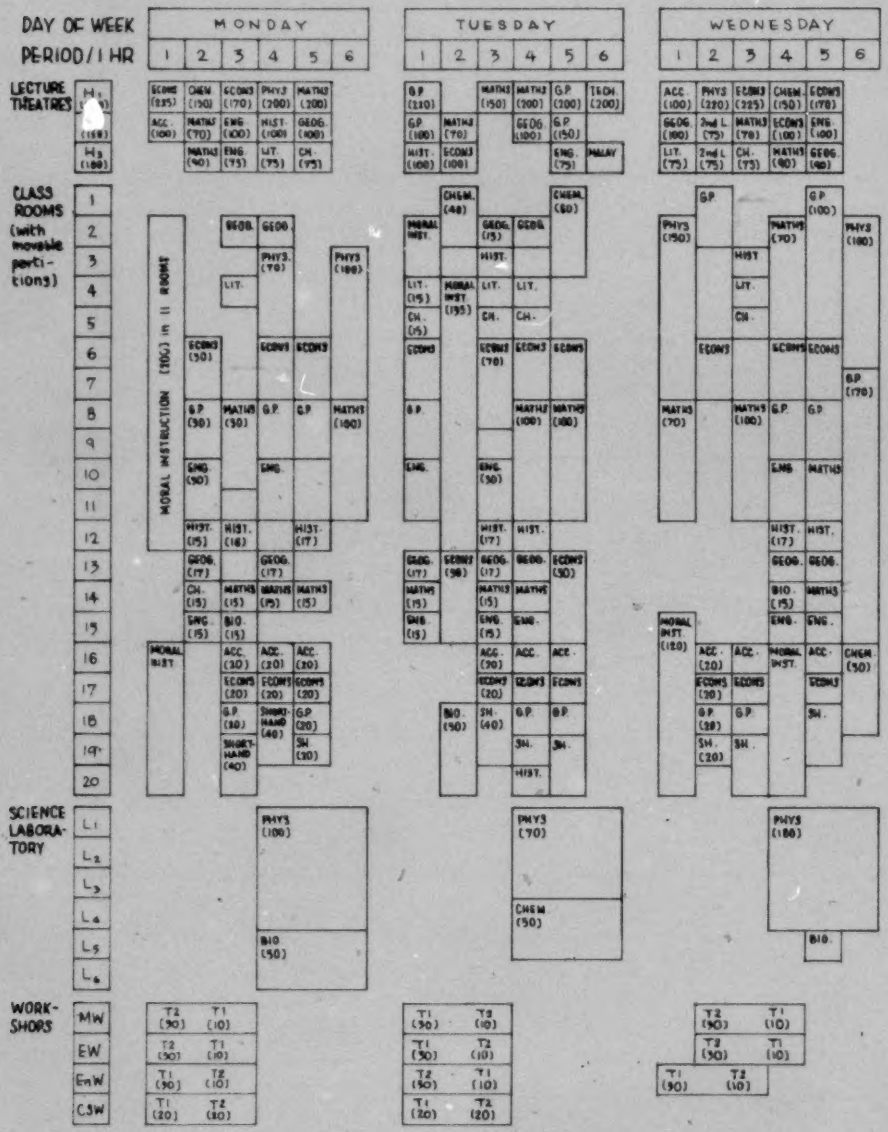
In cases where Management Committees have established the area requirements of the various teaching spaces, there is still the problem of relating this to a daily usage programme. Such a 'space-time' concept requires architectural interpretation and the architect needs to be very much part of the Committee if the end result is to be a workable brief. In the case of the Catholic Junior College, mentioned later in this article, the architects were active at the pre-planning stage and a 'room-usage' programme chart was ultimately prepared from which basic planning could be developed (the diagram overleaf illustrates a small portion of the room-usage chart prepared by the firm).

At the same time, there is the need for the Committee to be given an indication of what the proposed new school would cost. Depending on the complexity of the requirements, even a fully developed brief with indications of floor areas cannot really be related to just an approximate costing of the total project until complete building plans are made.

Without detailed data on site conditions which in some cases may be such as to involve extensive piled foundations or drainage schemes, the brief is only the first step in enabling the architect to commence his planning, and until the design drawings have been completed together with the appropriate structural design, and all mechanical and electrical provisions mapped out, accurate costing of the project cannot really be undertaken.

Before all the various processes of developing the plans can be started, however, an estimate of the amount of money likely to be required has to

PORTION OF A MODEL ROOM-USAGE CHART



This model, giving only three of five and one-half days of study, and without the necessary Key to abbreviations for courses, has been adapted from the chart prepared in conjunction with the Committee members for the Catholic Junior College by the Alfred Wong Partnership.

be made for the purpose of collecting public subscriptions as well as obtaining grants from government. There is thus a 'chicken-and-egg' situation as to which comes first. Unfortunately, there is little choice as far as the architect is concerned as he, together with the rest of his consulting team, will have to produce some reference figures which can be used by the School Committee to raise the necessary funds.

The above problem must be considered under present conditions in Singapore where most of the new schools described in this article have had to be constructed while the process of fund raising is still in progress. In nearly all cases the construction of the new school building has at least been started before the full capital sum required has been collected. This imposes considerable strain on school Committees responsible for raising the balance of funds as well as on the consultant team who cannot be sure that certain essential amenities can be adequately covered by the as-yet undetermined total funds to be raised for the school. A greater period of time allowed for both fund raising as well as pre-contract planning would solve many of these problems, but the provision of educational facilities is usually of such urgency that achievement of the desired amount of time for preparation is seldom practicable.

Given these complex relationships between financial resources on the one hand and time allowable on the other, perhaps the only possible course is for both administrators as well as the technologists concerned with school buildings to bear in mind this combination of factors so that decisions can be reached without holding up the implementation of the school building programme.

The other major problem is with regard to the time allowed for the next stage of launching the school project, and that is the period between the completion of the design and the actual commencement of site operations. Assuming that the funds have been obtained from both private and government sources, such funding is usually tied to a definite period within which such new school buildings must be completed. At the early stages, committees are naturally hesitant to instruct the professional consultants to proceed with all drawings and documentation until funding of the project has been resolved. Once funding has been resolved, however, sufficient time is generally not available for total documentation and, very often, site work is started before full sets of drawings and other documents are ready.

As would be expected, this has disadvantages, chief of which is the difficulty of calculating an exact costing schedule of the project. A second disadvantage is the insufficiency of time for proper research to be undertaken for developing the more specialized facilities such as, for example, the audio-visual requirements of a multi-purpose assembly hall.

Thus there is some difference in the planning of schools in the private sector as compared to the government school programme which is a long-

term and pre-planned system where sites as well as planning for future schools form a part of every 'five-year development plan'. In contrast, the funding of private schools is never as certain, since assistance from both the private as well as government sectors is dependent on prevailing economic conditions at any given time. This also accounts for the fact that, once funds having been obtained, there is the need for immediate implementation, this being the only way of ensuring that the funds will be committed. In many cases, therefore, the architect's orthodox or systematic method of progressing from design drawings to working and other technical details has to be telescoped and vastly modified to comply with the sudden and accelerated programme that he is called upon to fulfil.

Given the above conditions which are most likely representative of those experienced by the practising architects whose works are described in this article, it is of interest to view the end-products which are in many cases the results of accelerated programmes and the vicissitudes of stop-and-go processes.

Parameters and determinants

Located in the humid tropics, 3° north of the equator, the prevailing climatic condition in the Republic of Singapore has a major effect on the planning of schools. The majority of the teaching areas in school buildings are not air-conditioned and therefore rely on natural ventilation for comfort. The by-product of this is the arrangement of parallel linear blocks predominantly oriented towards north and south.

One of the design problems encountered in this form of planning is the long lines required for human circulation and, consequently, the disadvantage of the building being too decentralized within the site. This of course results in a lack of close integration between various elements of accommodation.

In the examples to follow, it will be seen how the architects concerned have endeavoured to resolve this problem, at the same time maintaining the essential provision of natural cross-ventilation as well as a certain degree of segregation between one block and another, to minimize noise transmission.

In the case of some of the junior colleges, air-conditioning is provided for areas such as lecture theatres and libraries. This allows for some freedom in the arrangement as these elements do not rely on natural ventilation. There is also an example of a completely air-conditioned school building which illustrates the configuration that would be possible if the limitation imposed by the need for natural ventilation is removed.

The basic precepts of school design in Singapore, in parallel with the school system itself, have to be evolved from conditions relevant to Singapore, while recognizing that there are lessons that can be learned from

both successes and failures of overseas examples. Some of these precepts can be summarized as follows:

1. Schools are institutional by nature and organization, but school buildings should not—or need not—be institutional in their physical attributes;
2. The objective of providing a well-rounded education with varied extra-curricular activities calls for the careful planning of other spaces in addition to classrooms, so that there will be the greatest amount of flexibility to cater for such activities;
3. The school, although housing large numbers of students, should not be overwhelming in scale to the individual. Where generous ceiling heights are required, for example, to provide comfortable conditions, relation to human scale should nonetheless be achieved by architectural means;
4. The environment for education should be an integral part of education itself;
5. A clear sense of order in creative design should be applied so that the plan is evolved logically from the physical characteristics of the site on the one hand and the requirements of the teaching programme on the other, bearing in mind at all times that the basic aim is to make a functional environment for learning while attempting to maintain a rapport between students and the natural environment.

A paraphrase of the above interestingly provides some of the basic concepts underlying the design of most modern buildings. Thus, while some of the oldest schools reflected the decoration of Imperial Chinese palaces, none of the new schools contain any design quotations from the past. While some critics lament the fact that architects of Asian countries, such as Singapore, do not produce buildings with a recognizable Asian flavour (which usually means the outright reproduction of some 'Asian' idiom), it can be said that the examples listed in this discussion have been evolved from the requirements of the present-day, in terms of what can be built with the available resources of the 1980s.

Description of new educational buildings

The following are recent examples comprising four junior colleges, one special private school built by the American Business Community, and one Technical College. As this is in the nature of a short survey, no special features of any of the projects will be highlighted, although the architectural thinking underlining each project will no doubt be seen from the plans and illustrations. Condensed versions of the project architect's comments on the respective school buildings are included as a means of amplifying the main design intentions.

The Hwa Chong Junior College

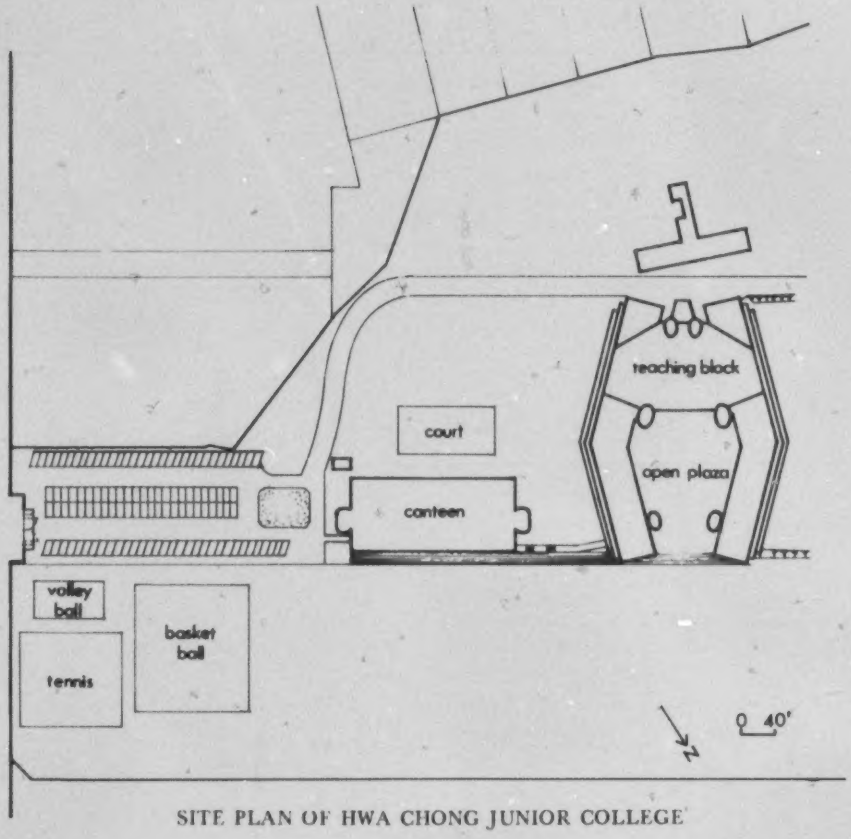
Architects : Goh Hock Guan Design Team

Project cost : US $1.32 million

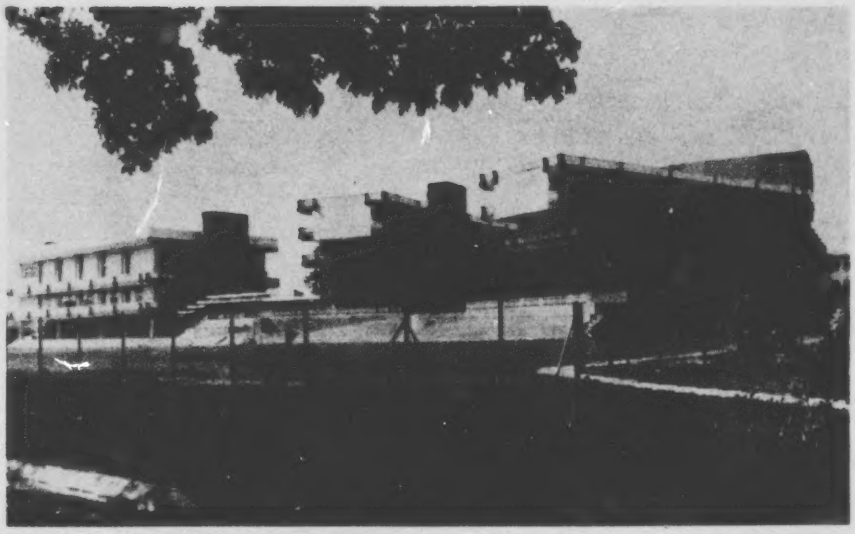
This is the first non-government junior college to be completed. The medium of instruction is Chinese (Mandarin).

The project architect's comments are:

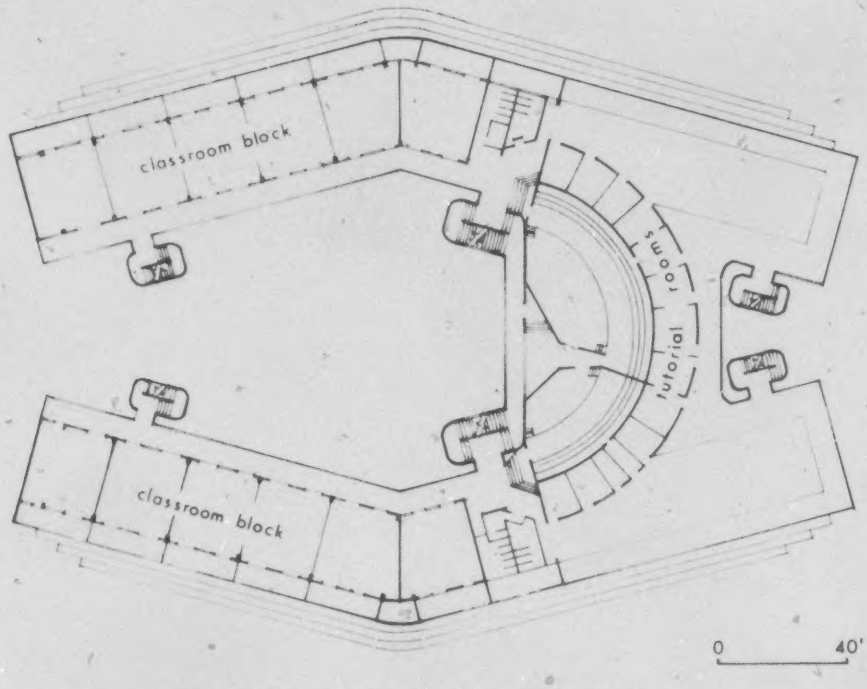
"The Hwa Chong Junior College is located next to the Chinese High School in Bukit Timah Road. The development consists of a five-storey main teaching block, linked by a covered way to a canteen/gymnasium block, and a renovated two-storey building for students' activities. In designing this junior college the architects aimed to achieve a strong character and personality for the buildings which would also reflect the cultural traditions of the Chinese High School."



SITE PLAN OF HWA CHONG JUNIOR COLLEGE



Hwa Chong Junior College



CLASSROOM FLOOR PLAN OF THE COLLEGE

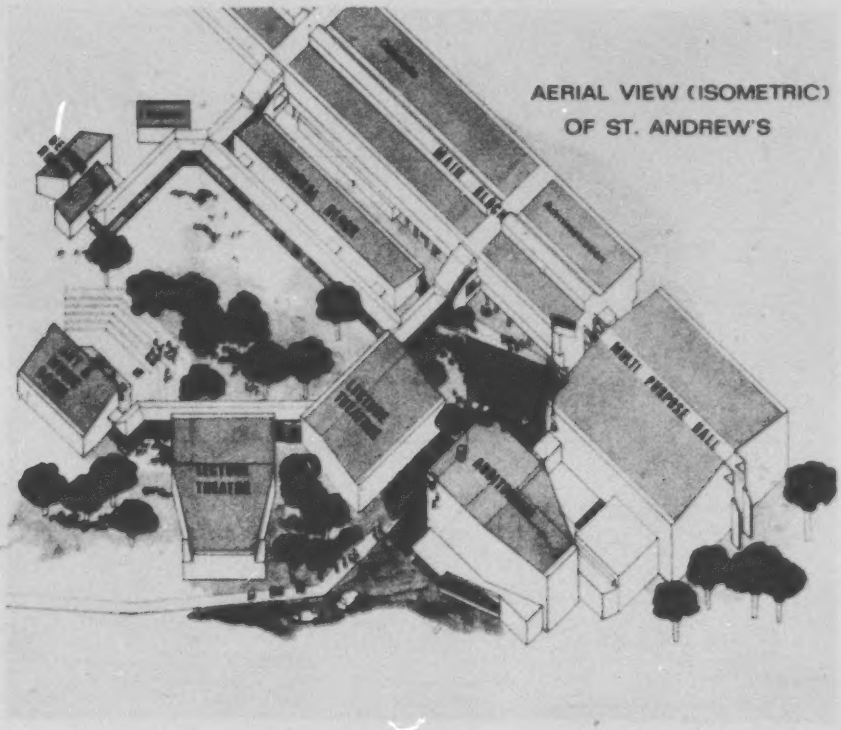
St. Andrew's Junior College

Architects	: Design Partnership	
Project cost	: Building	US $2.4 million
	Furniture and equipment	US $600,000

The St. Andrew's Junior College is a combined effort of the Anglican, Lutheran and Presbyterian Churches.

The project architect's comments are:

"The 6-hectare site is situated about 5.6 kilometres west of the city centre. About half the site is taken up by an existing playing field. The remainder consists of undulating ground rising to almost 14 metres above the field. The design approach is strongly influenced by the need to provide flexibility to meet the rapidly changing educational requirements and the desire to maximize student interaction."



AERIAL VIEW (ISOMETRIC) OF ST. ANDREW'S

The Anglo-Chinese Junior College

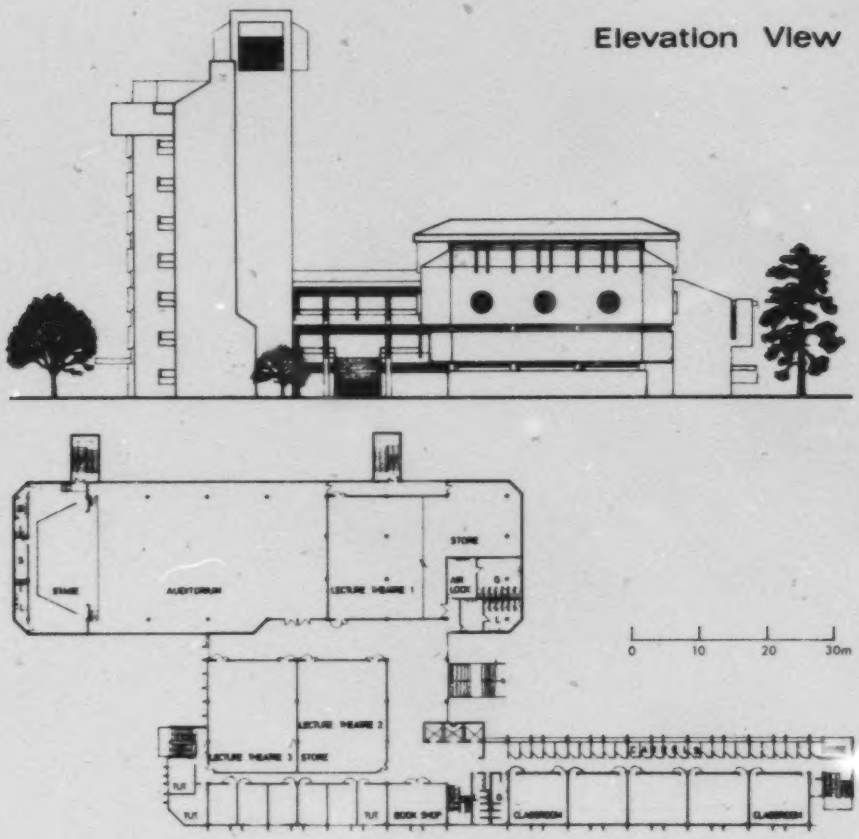
Architects : Chan Kui Chuan Architects

Project cost : US $2.8 million

The design is for 1,500 students of both sexes in the two major language streams, English and Chinese.

The project architect's comments are:

"Right from the beginning, the design was very much influenced by the concept of 'total education'. In essence, the architects conceived of the college as *per se*, a kaleidoscope matrix of learning, experimentation, consolidation and enquiry, complete with curricula to bring forth the students' appreciation for art and music and, last but not least, for sports or physical exercise as an integral part of the students' development."



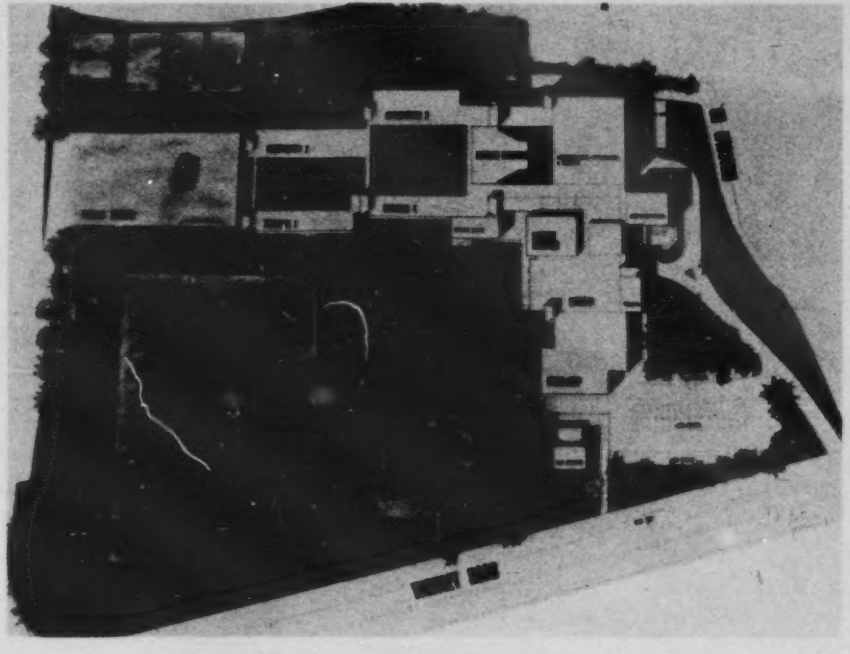
SECOND FLOOR PLAN OF THE ANGLO-CHINESE JUNIOR COLLEGE

The Catholic Junior College

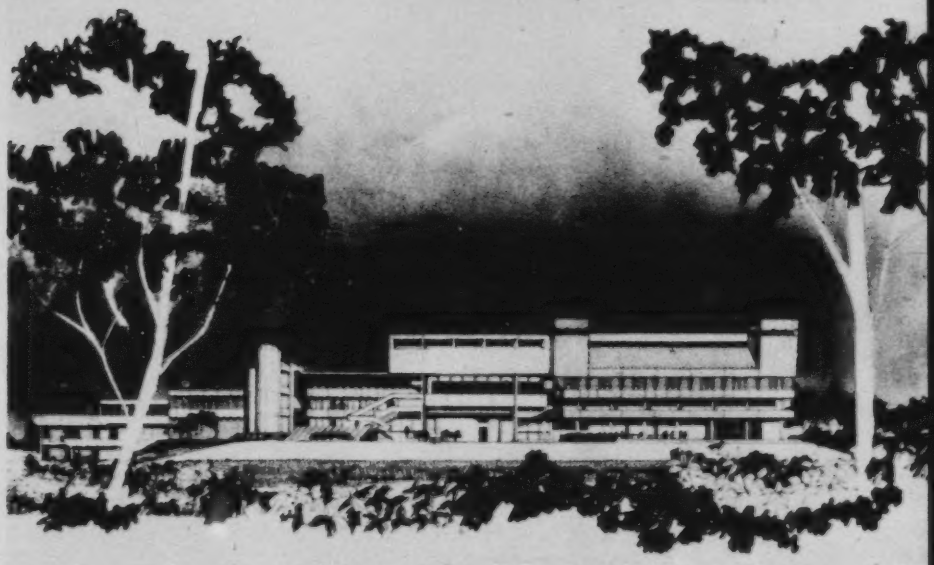
Architects	: Alfred Wong Partnership
Estimated project cost	: US $2.39 million
Equipment	: US $480,000

Funds for this college comprise a substantial government grant, financial aid from the Catholic Mission of West Germany, and donations from local contributors.

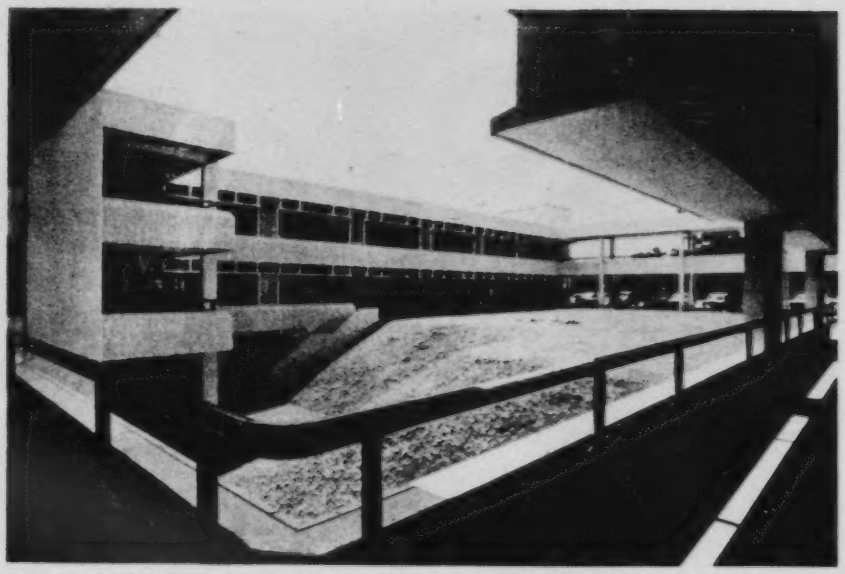
The college has been planned for a total student population of 1,500, the site being undulating with differences in level of up to 9.1m from grade. Opportunity was taken to arrange the various elements according to topographical characteristics of the site.



SITE PLAN OF CATHOLIC JUNIOR COLLEGE



Drawing of the view from Malcolm Road



Catholic Junior College—view of second courtyard showing sun- and rain-breakers

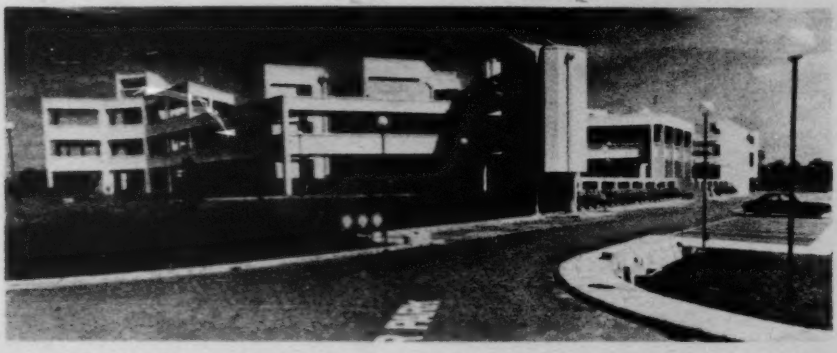
The American School

Architects : Sim and Associates

Cost : US $2.8 million (including furniture and landscaping)

The American school in Singapore was organized by U.S. citizens, and is run entirely on the American system. It is an interesting example of recent school building in Singapore and illustrates one approach to school planning in the tropics where adoption of full air-conditioning permits the integration of various teaching areas in an 'open plan'.

An open-plan school is what the words imply—a group of large open areas which contain few or no fixed walls and which feature individualized instruction. Each open complex has a flexible physical arrangement and a flexible teaching programme. Teaching strategies that enhance the open-plan concept include team teaching and differentiated staffing. The class organization is non-graded and accommodates daily shuffling of students' schedules, depending upon the needs of the individual.



The American School, showing hexagonal forms of the teaching blocks

Library with ancillary rooms on the left

Singapore Polytechnic New Campus

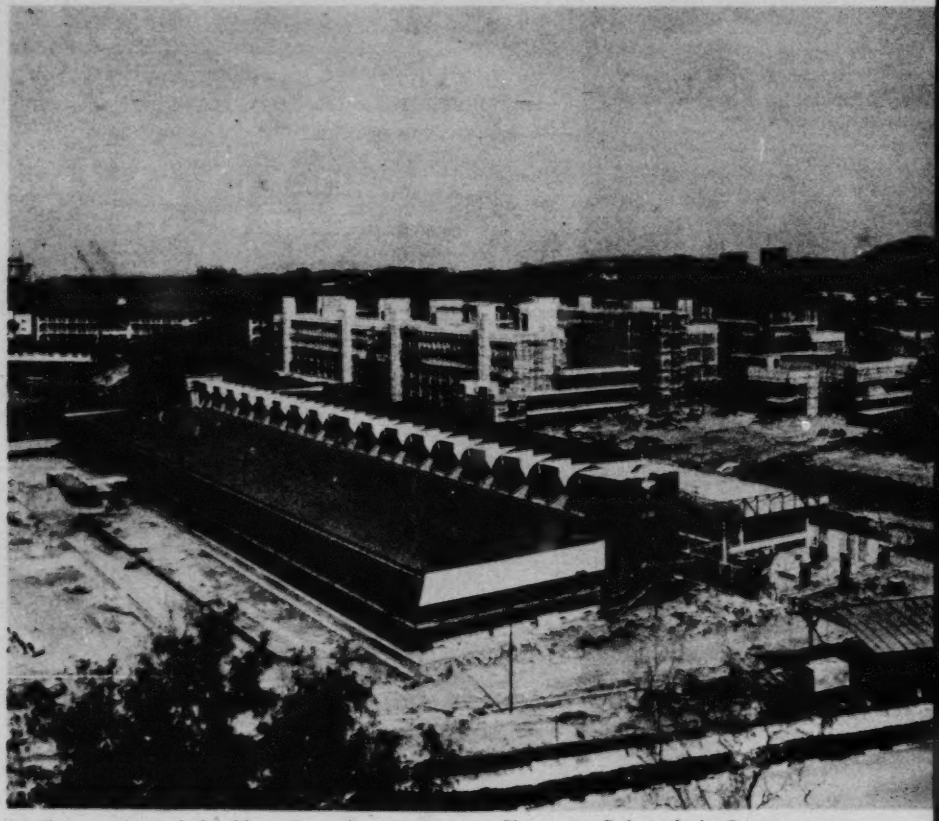
Architects : Alfred Wong Partnership

Contract cost : US $15.5 million

The Polytechnic New Campus has been planned for a total student population of 8,000 within a 35-hectare site.

The built-on area comprising workshops, lecture theatres, laboratories and classrooms totals 68,748 m^2.

Site works were begun in October 1974 and the Phase I buildings are now in use. The illustration shows the Electrical and Building Workshops, together with four teaching blocks and the Student Canteen.



Bird's eye view of the Phase I section of the new Singapore Polytechnic Campus at Dover Road, Singapore.

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for Education in Asia
Number 17, June 1976

BUILDING FOR TECHNICAL/VOCATIONAL EDUCATION IN THE CONTEXT OF CHANGE

by Amphon Pitanilabut

Introduction

This article discusses the main factors of building programmes for vocational and technical education which affect change and growth, as well as some aspects of building design which may influence future development programmes. It discusses the patterns of change, analyses problems and practices and recommends practical solutions for minimizing inconvenience when change in the educational facility programme occurs.

Planners and architects involved in the design of educational facilities should be able to anticipate change and be prepared to deal with unexpected problems. The building and its components should be designed in such a way that any conversions or extensions can be carried out in minimum time and at minimum cost. By improving the adaptability of physical features, pedagogical capacity and efficiency may also be increased.

Patterns of change and growth in the building programme for vocational and technical education stem from many causes. Some of these are identified in the sub-chapters which follow.

1. **Enrolment growth.** There is a constant direct increase in student population which calls for more space, equipment, work stations and other related facilities. Proposals for changes and extensions should be based on projections of student numbers. Facilities provided should be expandable in direct proportion to the foreseen increases in the number of students.

The number of students in a given school population may be increased by introducing shifts in the training programmes. Normally, the existing space and equipment should be sufficient to accommodate regular programmes. With the introduction of shifts, however, more space and services will be required for each extra session. For example, lighting will be needed for evening shifts, and more space will have to be provided for material and project storage, as well as for administrative areas and communal facilities. Changes and modification of the existing facilities are therefore required, but not in direct proportion to the number of students. One method of calculating the extra accommodation and equipment needed is that used in the United Kingdom, where the number of non-full-time

students is converted to a total number of F.T.E. (Full-Time Equivalents) as follows:

Full-time and 'sandwich'	– count as one
Part-time day release	– count as two-ninths
Block release of 12 weeks	– count as one-third
Block release of 18 weeks	– count as one-half
Short courses	– count as one-fifth
Non-vocational courses	– count as one-ninth
Evening courses	– omit [1]

2. **Up-grading of institutions.** For the countries of this region, there are many examples of higher institutions which were up-graded from lower-level institutions—technical schools to junior technical colleges, or technical institutes to degree-level colleges. It is difficult to forecast future up-grading programmes of this sort because the change patterns are usually unpredictable. Educational programmes after up-grading vary considerably; some institutions still offer training courses at lower levels, whereas the others concentrate only on the higher-level training.

In terms of the physical facilities needed in the changed programmes, training at higher level involves individual and group testing and more research work rather than manipulative skill training. The requirements for new programmes must be met by re-equipping and providing the new spaces needed. The activities may change quite substantially; therefore the existing spaces must be adapted, expanded or, possibly, compressed to suit the nature of the activities in each specific area.

3. **Change in employment opportunities and social demands.** The labour market demands play an important role in determining the types and levels of training offered. Some work specialities may not be in current demand and it will be wasteful of resources to continue the areas of training involved. The courses offered should, in these circumstances, be phased out and new curricula be introduced.

For example, when graduates in auto-mechanics are already in full supply in a community, it would be more appropriate to switch the programme to another related area. For instance, there may be a need for marine diesel technicians; if so, change and modification are required to arrange the proper training facilities for the new course—relocation of existing equipment and services, and rearrangement of space. If the nature of activities of the new course is entirely different, then more complex conversion must be dealt with.

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1. Great Britain. Department of Education and Science. Welsh Education Office. *Notes on procedure for the approval of further education projects.* H.M.S.O., 1972.

Ideally speaking, manpower demands should be a main consideration in making the decision for the training required, but sometimes social and political pressures that are placed upon the educational system influence the making of decisions. Under such circumstances the political representatives are almost always inclined to follow the demands made by their constituencies.

Courses offered in some areas may not be in popular demand because of the social bias. For example, foundry-work or blacksmithing may be considered to be dirty and undignified. An assessment must be made of the economic viability of continuing unpopular programmes. If it is decided to discontinue them, the space and facilities should be converted to other, more productive use.

4. Technological and pedagogical development. As development is made in the technological and pedagogical aspects of vocational education, the methods of training will undoubtedly be altered. More analyses and more precision work are needed in some areas. Training in one specialized trade may become, in some way, related to another; hence the training space may be rearranged to facilitate inter-departmental relationships, or shared facilities may be provided.

It is necessary for technical training programmes to keep abreast of the rapid developments in modern technology. Up-to-date and improved machinery and equipment must be acquired to replace the obsolete stock. More air-conditioned space is likely to be needed in order to maintain constant temperatures and dust-free areas.

The modification of existing facilities for the development programme sometimes requires rearrangement of spaces and relocation or installation of machines and service lines. Therefore, for the purpose of future facilities development, services should be installed in such a way that change and relocation can be made easily: it is vital that the job take the minimum time, at the lowest possible cost. Moreover, improvement and modernization of the visual and physical environment must be made from time to time in order to bring about better working efficiency.

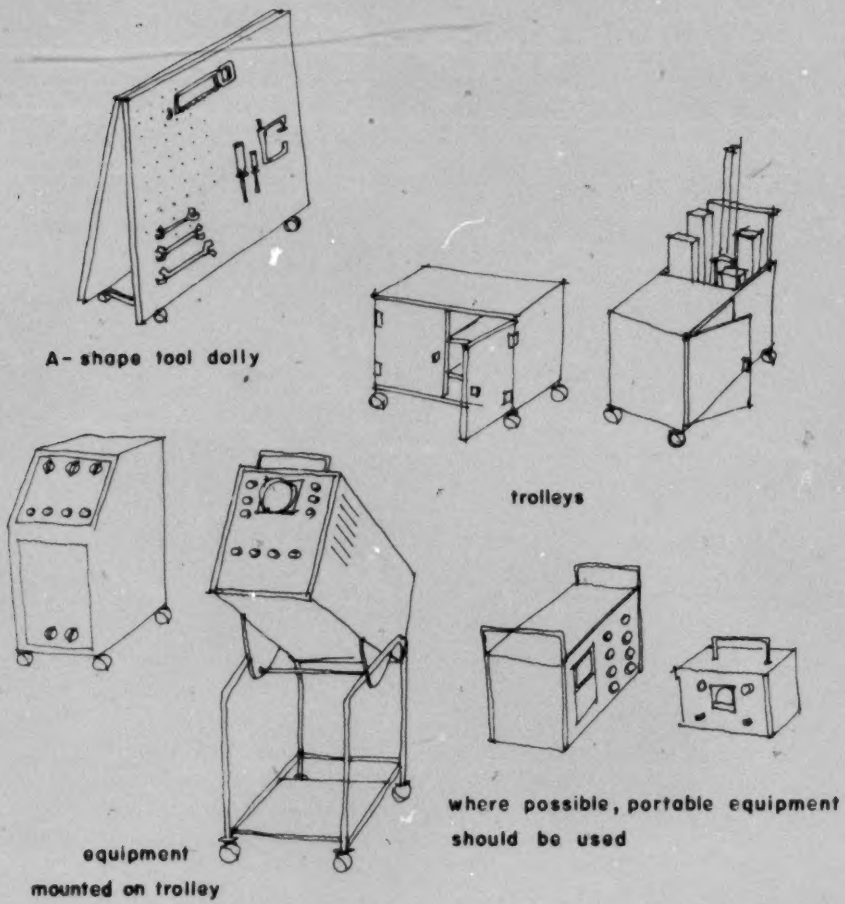
5. Trend towards 'miniaturization'. The rapid developments in technology, especially in the electronics field, have had great impact on industrial products. Training equipment and apparatus is increasingly being made portable and relocatable, thus facilitating operations that require movement. It is evident that space-saving items will be preferable in any laboratory.

The trend towards miniaturization of equipment will, to a greater or lesser extent, affect the future design of buildings and furniture for vocational and technical education. The decrease in space required should result in cost reductions.

Flexibility versus inflexibility

In view of future changing demands, the main consideration in the planning of educational buildings must be the provision for flexible and adaptable space. There are a number of proposed solutions for adaptability, many of which represent realistic and practical approaches. However, the degree of flexibility required for buildings for technical education will differ from one element to the next, and from one type of training to another. For light activity (e.g. electronics, light crafts), facilities can be arranged with a higher degree of flexibility. By using portable equipment and relocatable furniture, considerable convenience in the rearrangement of space can easily be achieved.

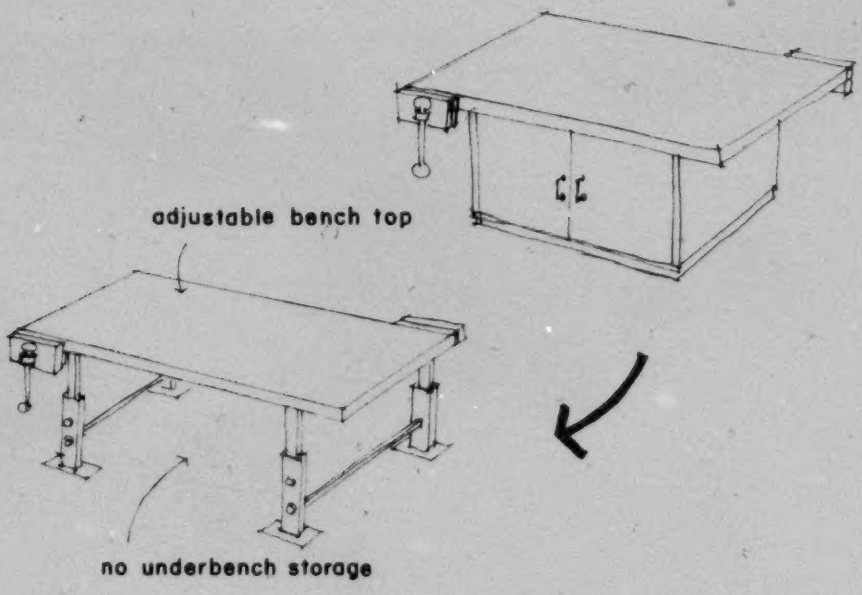
FIGURE 1. EXAMPLES OF PORTABLE AND MOBILE EQUIPMENT



On the other hand, heavy machines are required for many technical training courses. The installation of these machines requires handling and moving, often with forklift truck and hoist; they are fixed in place by anchor bolts and connected to intricate service lines. Once the machines are in their proper place, they will rarely be moved. In this case, the degree of fixity will be higher than that of flexibility.

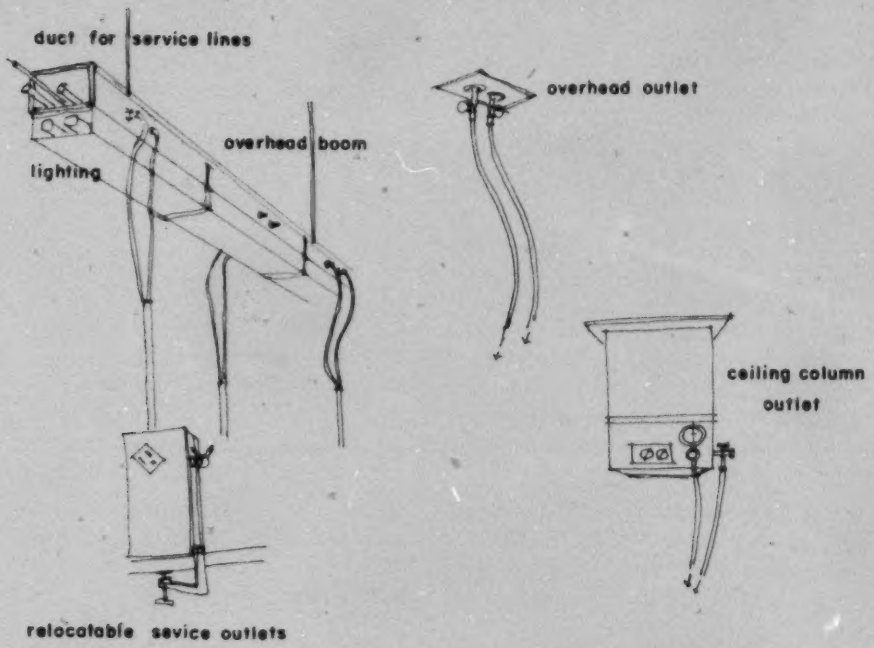
Space in laboratories can be arranged in such a manner that some parts are fixed and others are adaptable. For example, a science laboratory may be equipped with fixed islets housing all services and surrounded by movable benches. Fixed machine areas and relocatable bench areas are found in some workshops. To allow for the possibility of frequent relocation, workbenches should not have storage spaces or cupboards underneath. (See Figure 2) Tools and material should be kept on their own in separate places and not at the workbenches.

FIGURE 2. COMPARISON OF WORKBENCHES



Workbenches and other furniture connected to service lines (gas, water, electricity and compressed air), cannot be relocated conveniently because all the lines would have to be disconnected and re-connected. The employment of overhead booms and flexible connections allows more flexibility. By using movable furniture, portable equipment and relocatable services, the frequent rearrangement of space can be achieved without undue difficulty. (Figure 3)

FIGURE 3. EXAMPLES OF OVERHEAD OUTLETS



It is evident that adaptability and accessibility for future maintenance can be gained by using an overhead service system. But depending on the nature of activities, an under-floor system is sometimes more appropriate, especially where the dropped wires and tubes from overhead booms may obstruct the handling of training material. A concealed system also gives a better appearance because it keeps space under the ceiling clear.

The use of movable furniture, mobile trolleys, adjustable shelves, demountable partitions and relocatable services can be considered as basic solutions to the problem of future adaptation. Nevertheless, there are some practical limitations in relation to the initial investment as it is usually more expensive to provide such relocatable items. If the need for change is frequent, the higher initial investment will in the long run be well repaid. Therefore design for this sort of adaptability should only be considered where absolutely necessary or in cases where the expected change is certainly and frequently required.

The fixed and adaptable parts of the building and its components should thus be arranged according to the expectancy of change. For example, the structure and building envelope, stairs, toilets, and service mains can be considered as fixed, while interior partitions, storage and service branches should usually be made adaptable. The elements that

may be changed or relocated frequently are workbenches, storage cupboards, and display and experimentation rigs.

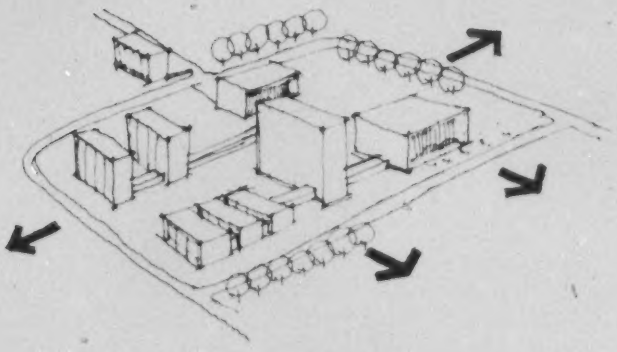
In design for change, there are many factors to be considered regarding potential life, potential change, frequency of change and other matters, most of which affect capital and recurrent costs. Those factors should be thoroughly analysed before deciding on the design criteria. Like other aspects in design, the final decision on the degree of fixity and flexibility will require compromise.

Conclusions

When future change can be anticipated in the building programme, preparations for it should be made in advance. Irregular natural growth usually leads to chaos, and the period and patterns of growth are difficult to predict. Therefore, the design of buildings and other related facilities should provide room for planned growth as well as possibilities for future adaptation in the event of unforeseen conditions. Further recommendations for physical facilities programme in the context of change would be as follows:

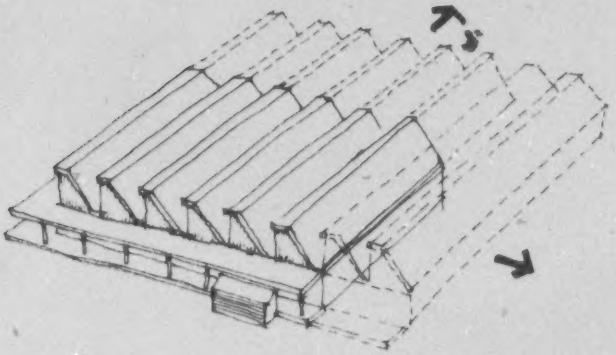
Building programme. Site development should be planned for overall growth according to the development plan. The building programme should be phased in successive stages, such that at each stage, new buildings can be put up to accommodate more students. (Figure 4)

FIGURE 4. ROOM FOR GROWTH



Buildings for specialized accommodation should not be designed to serve only a unique purpose. It is recommended that a basic building 'shell' be provided to cover all present and immediate future requirements. The use of standard planning modules, extendable modular structures or repetitive units will facilitate possible future extensions. (Figure 5)

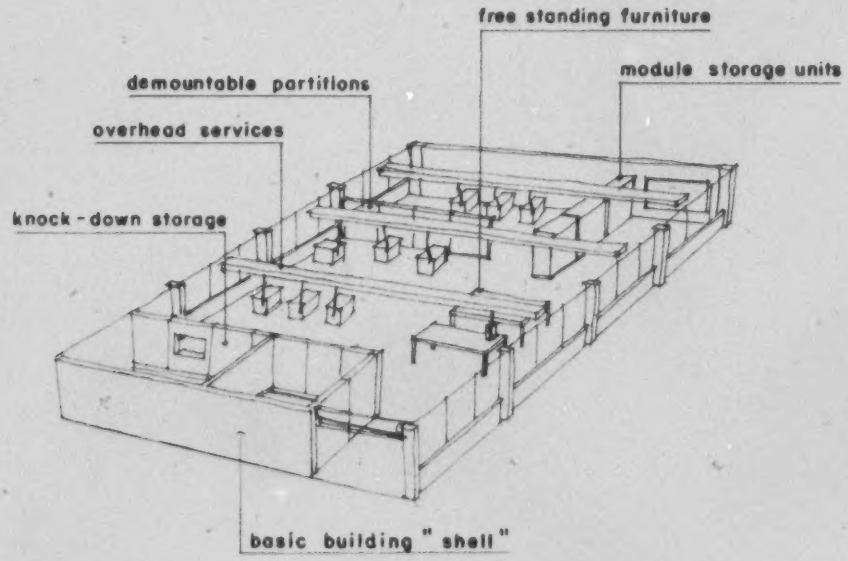
FIGURE 5. EXTENDABLE MODULE STRUCTURES



Wide-span structures will provide more flexible space for open-plan laboratories. Space can be allotted for specific uses by the arrangement of internal partitions. Large spaces allow more possibilities for alternative internal arrangements and rearrangements. (Figure 6)

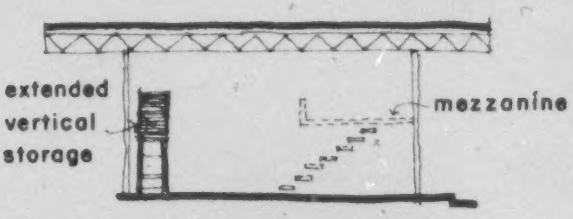
'Free-floor area' in laboratories should be provided for immediate future needs. Otherwise only a slight alteration of current courses, such as the introduction of a new project or the installation of a few more machines may change the whole floor plan, necessitating electrical or plumbing rearrangements.

FIGURE 6. A FLEXIBLE LABORATORY



When the space in workshops is overcrowded, vertical extensions such as mezzanine floors, extended vertical racks and overhead, 'dead' storage are often provided to alleviate the situation. Where possible, ample headroom must be provided to permit this. (Figure 7)

FIGURE 7. AMPLE HEADROOM FOR VERTICAL EXTENSION

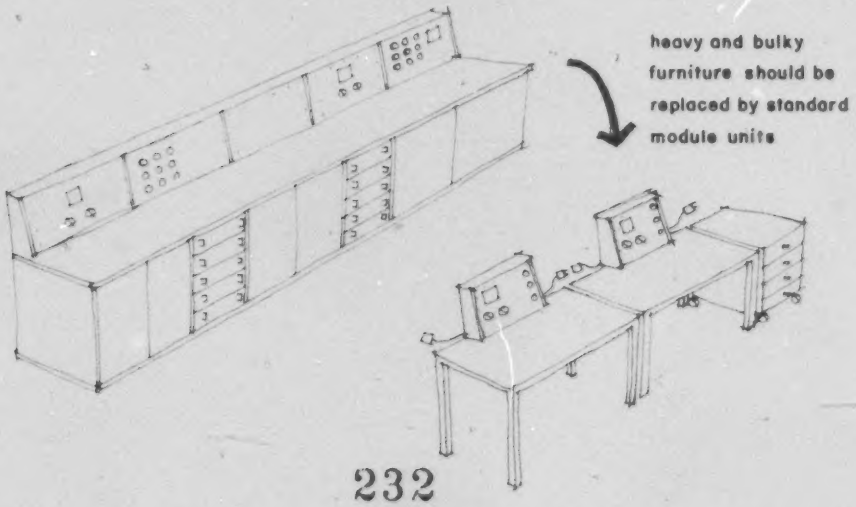


Where necessary, demountable partitions may be used. They should be non-load-bearing and free from all service connections and storage shelves.

Equipment and services. When possible, equipment should be portable or mounted on mobile trolleys. Some equipment will not be required continuously, and convenient spaces should thus be arranged so that it can be stored when not in use.

Large-scale machines and complex processes should be stimulated by using small equipment or scale models, and more compact, experimental projects should be introduced.

FIGURE 8. MODULAR EQUIPMENT



Ramps, passage-ways for fork-lift trucks, and hoists should be provided to facilitate handling and moving of machines.

All services should be easily accessible for repair or replacement. They should be provided with sufficient reserve capacity for immediate future additions. Allowance must also be made for reserved space in service ducts, and provision made for extra service outlets for future use.

Furniture. Bench-top and storage units should be separate. A recent survey of laboratories revealed that under-bench storage has very low utilization, because only a few items can be left there permanently.

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THE LOCATION AND DISTRIBUTION OF PRIMARY SCHOOLS IN THE ASIAN REGION

by J.A. Johnston

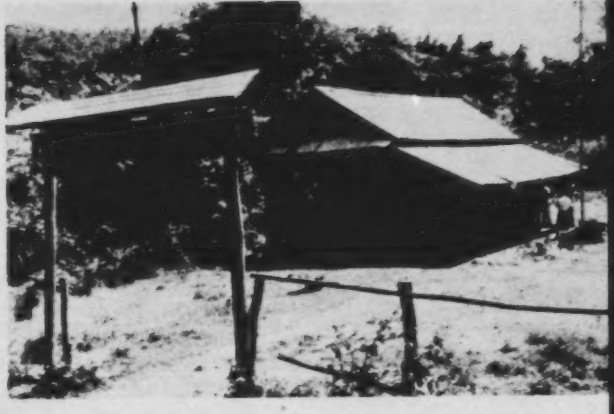
Introduction

Over the period 1967-75 research has been undertaken by the author in many countries of the Asian region in search of answers to the following questions:

1. What factors govern the location and distribution of Asian primary schools?
2. In what way does the location and distribution of Asian primary schools affect educational equity (of access and provision) and efficiency (particularly in terms of pupil retention)?

Both questions need be viewed against the backdrop of the intentions of the *Karachi Plan* to provide (as rapidly as might be possible) seven years' free and compulsory education for all children.[1] Such an intent is

1. At a meeting held in Karachi in 1959-60, the Member States of Unesco recommended, *inter alia*, that attempts be made by all countries in the Asian region to achieve free, universal and compulsory primary education. The recommendation formed part of what was subsequently called the 'Karachi Plan'.



at one and the same time a statement of equity (education for all primary-aged children) and efficiency (the supposition that all might be received in school for a given time period). The research represents a very limited evaluation of progress with regard to facilities towards these ends.

Survey of planners

In 1969 and subsequently in 1971-72, questionnaires were sent to educational planners, at national and state/provincial levels in some 17

Asian nations.[2] The questionnaires were directed to those with the responsibility for making decisions about primary school distribution and location. For the 1969 survey, only one ministry of education could provide accurate map material, and this was for but small regions within the nation. No other national or sub-regional authority could provide a base map which at any geographical level depicted schools by social type, grade structure, or language medium of school. None could provide maps of primary school facilities by network relationship—that is, schools which fed pupils into other levels or type of primary education—and none could accordingly provide, for even sample areas, enrolment and attendance data for individual schools or networks of schools.

The survey of 1971-72 requested educational planning divisions in the same ministries or departments of education to identify scale, and rank those factors which they took into account when planning the location and distribution of primary schools. The replies indicated three clear pre-occupations. Planners consistently ranked the following factors as ones of prime importance:

a) Present area of pupil supply;
b) Ease and cost of school site acquisition;
c) Availability of essential services and transport facilities.

Equally uniformly, planners ranked in categories of *seldom considered* or *never considered* such factors as:

a) Present teacher supply area;
b) Pupil quality (e.g. language, socio-economic class of child); and
c) Future pupil supply area.

These somewhat unexpected results suggested that planners concerned with the attainment of Karachi Plan goals had been too little concerned with the locational and distributive aspects of facilities provision.

Primary school location: a factoral analysis

In an attempt to assess just what factors had in the past influenced primary school location, field studies were undertaken and data on 2,263 primary schools were compiled by observation schedule. Using a prime location factoral analysis these case studies were classified under six headings and were categorized as follows (categories overlap, but in all instances a decision was taken on the *major* locational relationship involved, this being termed the prime factor in location and categorized accordingly).

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2. The author's thesis, of which this article is a brief summary, does not list the countries covered by the questionnaire /ed./

Prime location factor	Percentage of primary schools in survey
1. Demographic (pupil distribution and supply)	53.8
2. Transport (proximity to major road, rail, or water-way)	22.8
3. Expediency	10.8
4. Change (administrative, political or environmental)	5.4
5. Socio-cultural (language, socio-economic class of pupil)	4.9
6. Economic and socio-economic	2.3
	100.0

As the table indicates, the great majority of Asian primary schools (53.8 per cent) have in the past been located in accord to pupil distribution. The village primary school (Plate 1) or the urban/suburban community primary school is the typical school of Asia. In most instances, however, the site, form and function of the habitation (or the nature of a dispersed rural population), together with considerations of topography and micro-climate also modify within-community location. In other instances, administrative rules-of-thumb governing, for example, the distance a primary school child might be expected to walk to school, have also dictated micro-location and affected patterns of distribution.

Plate 1. An Asian village primary classroom

A significantly large number of primary schools within the sample (22.8 per cent) have been located to facilitate the movement of pupils. The crossroads, road or river-side school is a prevalent Asian phenomenon, as schools located on road junctions some distance from habitations attest. (Plate 2)

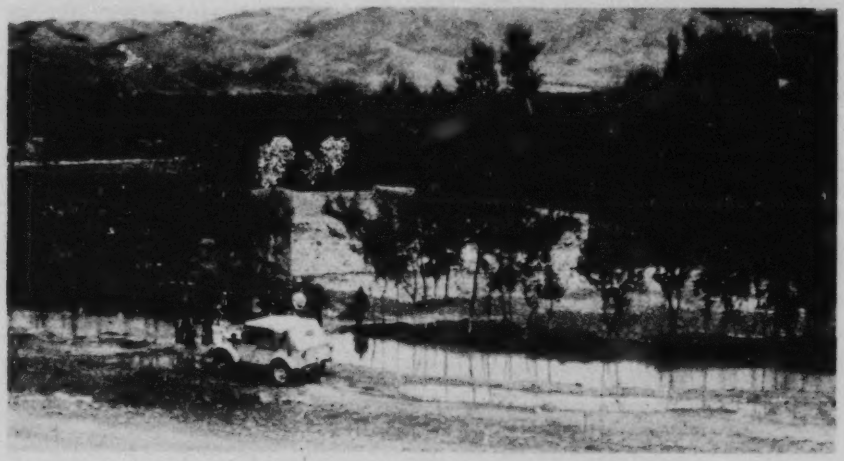

Plate 2. A school situated at a road junction

One of the major findings of the case study investigation was the comparatively large number of primary schools (10.8 per cent of sample) that were adjudged to be the locational result of administrative, political and economic expediency. Characteristic of such locations were primary schools located some distance from the community served (Plate 3)—or separated from that community by physical barriers such as rivers and mountain ranges. *Ad hoc* locational decision-making, clearly influenced by considerations other than educational, have created some fascinating anomalies. The gift of school sites has been a common Asian occurrence and the process has at times been used to advantage by the donor.

For example, in one location there is the prominent example of a school located on a cross-road some distance from the two village populations served. Children travel by cheap buses in order to attend. On first appraisal this location appeared to be a sensible adjustment of a transport-oriented school, designed to serve two communities. Upon investigation it was found that the school site in question had been donated by the proprietor of the local bus company.

A comparatively small but nevertheless important number of primary schools appears to have locationally resulted from situations of change. Administrative decisions in regard to school structure and organization (for example, the trend towards school consolidation, or co-education—or

Plate 3. The community cannot be seen from the school.

again the adoption of a uniform linguistic policy) have led to the abandonment of some traditional locations, in favour of new sites more attuned to the needs of the 'new' institution.

Another rather small, and probably diminishing number of schools in the sample (4.9 per cent) have been located upon considerations of the socio-cultural nature of the community served. For example, in many Asian nations, religious institutions have formed primary schools which remain as initially located in the shadow of temple, wat, monastery, mosque, and cathedral (Plate 4). In multi-ethnic and multi-linquistic societies, the socio-cultural division of population distribution (into enclaves) has similarly appeared to have influenced primary school location, particularly where the language medium of instruction is that of the 'mother's knee'.

Surprisingly, socio-economic factors do not appear to play a dominant role in primary school location (2.3 per cent of cases). Nevertheless, there are cases where the socio-economic status of the community has influenced where schools have been sited. For example the schools servicing most of Asian urban shanty-town or 'slum' communities appear mostly to have been located on slum outskirts or fringes. In some instances in India social caste considerations have, in the past, influenced school location as schools outside rather than within Harijan villages indicate.

In summary, the analysis of existing school location showed rather crude traditional models of location indicative more of a lack of planning than any mature assessment of which a range of factors would have provided. There appeared to be little correlation between past location, and what planners say they now consider or now do. Indeed the location of recent schools appears to emphasize traditional factors from which expediency cannot be excluded.

Plate 4. Primary school classes held in a mosque.

Primary school distribution

In the course of assessing, mapping and plotting primary school location in some 16 countries of the Asian region, it became apparent, particularly from sub-regional studies (sample areas of approximately 100 square kilometres) that distributional problems were in one way or another a major stumbling block to equity of access and many children's equity of opportunity to enrol in an appropriate primary school and to remain enrolled. From these standpoints (equity of access or initial enrolment, and efficiency or retention of enrolment) and analysis of primary school distribution patterns revealed four types of primary school network, those that were: (1) Network complete and efficient; (2) Network incomplete yet efficient; (3) Network complete yet inefficient; and (4) Network incomplete and inefficient. To examine each pattern briefly and in the order given:

1. **Network complete and efficient.** This pattern of school interrelationships, or pattern of provision was most typical of Asian urban regions, and of rural regions in the more educationally advanced countries. In urban areas, the basis of patterning was the suburban neighbourhood type of school organized on a single- or double-shift attendance system. Typically, these schools were grade-complete (a full 7 or 8 grades) and were located within easy walking distance of pupils. In rural areas, this pattern was generally characterized either by a grid of grade-complete

primaries situated in major villages and towns—or grade-complete lower primary schools (grades I–IV or I–V) feeding into larger and more centralized primary schools with inflated accommodation for upper primary school pupils. These patterns typically generated high initial enrolment rates and high retention rates.

2. **Network incomplete yet efficient.** When viewed on a map these patterns of primary school distribution superficially possessed all the features of incomplete networks. Further, the number and distribution of primary schools appeared inadequate to the pupil population base, or the schools were urban-concentrated with nearby rural areas apparently poorly served. In other instances, the ratio of upper-to lower-primary school places seemed to be disproportionate—there being too few upper places to ensure pupil progression or retention. Field investigations revealed, however, that these superficial deficiences had been overcome to yield high initial enrolment rates, and consequent high retention rates. Two basic strategies had been adopted—the subsidized transportation of primary-aged pupils to school (e.g. from rural lower-primary schools to double-shifted upper-primary schools in the towns) and/or the double or triple shifting of fully graded, complete primary schools.

The above two network patterns were in the regional studies somewhat less common than the two which follow.

3. **Network complete yet inefficient.** These networks appeared on the locational maps to have all the characteristics of network completeness. The number and distribution of schools appeared adequate to meet demand. The hierarchy of lower and upper primaries equally seemed ratio adequate. Upon field investigation, however, a very different picture emerged. Despite the apparent distributional maturity of these patterns, both initial enrolment and subsequent retention rates proved to be lower than expected. The field studies revealed, as a prime causal factor, schools which were mal-distributed in terms of their social and economic context and environment.

For example, in some multi-ethnic settings the language medium of the schools did not accord with the distribution of pupils by language group. Frequently, primary school children speaking a minority tongue were those at greatest disadvantage. While there may have been schools near the place of residence teaching in their vernacular, such schools were typically lower primary (grades I–IV) and then often incomplete, with perhaps only two or three grades of instruction offered. Schools with upper-primary grades in the child's vernacular were frequently too far away or too expensive to reach.

In other instances, the schools distributed across the map turned out to be single-sex institutions. By tradition or design, such schools were mostly boys' schools, and similar facilities for girls or for co-education

were non-existent. Even in cases where co-educational primary schools existed, custom and religious *mores* were occasionally such that few girls enrolled or maintained enrolment. In other cases, the schools provided were discovered to be semi-private, fee-paying institutions or schools administered by a minority religious group. While schools undoubtedly existed, they were—in community terms—socio-economically unsuitable. They were either beyond the capacity of parents to afford, or else were beyond the pale religiously. Such schools were generally attended by an elite; the mass of children could not benefit from them.

As indicated previously, the public schools of Asia's shanty towns and slums were found as a fringe phenomenon. In many instances these institutions were poorly attended by slum children and many even possessed 'surplus capacity'. Field studies in Indian, Filipino, Thai and Indonesian communities of this kind revealed that parents were reluctant to send their children beyond the shanty town community for the purposes of schooling. Frequently the schools outside the community were viewed as alien institutions. Besides, many such schools insisted upon a lump-sum payment for school fees, or required a school uniform, or the parental provision of books and materials. These financial obligations were clear obstacles to enrolment and retention. Moreover, the location of schools outside the community placed an additional burden upon the urban poor in the form of transport costs. (In a number of communities, however, these financial hurdles have been surmounted by private schools. These schools in poor areas charge a low daily sum for attendance and set no other requirements by way of fees, uniforms or textbooks. Often illegally operated, such schools are generally well attended and are thus examples of institutional adjustment to reality).

4. Network incomplete and inefficient. These patterns are more prevalent in Asia than is often assumed. The major characteristic of the pattern is the networks of primary school distribution which are deficient in coverage and/or (and usually both) deficient structurally. In its most elemental form, the pattern of school distribution is unbalanced, with schools concentrated in large villages or towns, and with rural areas (the small isolated rural villages) being poorly served. A large number of field studies revealed a lack of reasonable access for many rural children. Much more common, however, are networks comprising a hierarchy of schools; typically a lower-primary school system of four or five grades and an upper-primary school system offering generally in separate institutions grades VI–VII or VI–VIII. In India and Thailand especially—but in parts of other countries where such hierarchies exist—field investigations revealed school systems which were incomplete with regard to grade structure at both levels.

In small villages, many lower-primary schools—ostensibly schools with up-to five grades—were discovered offering only the first and second

grades. Children seeking to continue a lower-primary education often found that schools offering the next higher grade were too far away to attend. More typical were the network imbalances which accrued from the low-ratio provision of schools by stage (upper-primary or lower-primary). Rural children having completed a lower-primary schooling, in very many cases, discovered that the nearest upper-primary school was located in the distant town or the large village many miles away.

The upshot of this mal-development of school hierarchies is generally low initial enrolment rates and even lower retention rates through to the last primary year. It may seem an extremely elementary proposition, but its truth needs repeating: children cannot enrol in school if there is no school in which to enrol. They cannot remain in school if there is no appropriate school in which to remain.

The influence of school distribution upon wastage

The import of the preceding section strongly infers that school location and distribution provides comparatively poor access and provision to the children of the urban-poor, the isolated rural dweller, the ethnic or linguistic minority. Girls in most communities are similarly poorly provided for. These groups have long been acknowledged as being at a disadvantage in other educational ways. We may now add a facilities-distribution disadvantage. By implication, moreover, the foregoing analysis in all its brevity also strongly suggests that the mal-distribution of primary facilities—of school networks which are incomplete or inadequate from the standpoints of distribution, structure, or social situation—is a principal factor to be taken into account in any consideration of school inefficiency or pupil wastage. Yet the literature dealing with primary school wastage pays scant attention to distribution issues. Indeed the burden of the research work on wastage undertaken has tended to explain its causes solely in terms of two clusters of factors: those that relate to the quality of schooling (poorly trained teachers, large class size, lack of teaching facilities) and those that relate to the quality of the child's home environment (social class, poverty, the need for child labour, the lack of perceived relevancy of schooling).

Using data from the Second All-India Survey (1969-70) and the Royal Thai Ministry of Education Surveys (1971-74), it has been possible broadly to evaluate the comparative merits of quality of school variables—for example, quality of teachers in terms of such aspects as training and educational qualification, school and class size, quality of facilities, and school network variables—such as ratio of upper- to lower-primary schools, or grade completeness/incompleteness. Such an evaluation employing two-and-one-half million statistical data components has only been possible through the use of a modern computer system (using step-wise multiple repression techniques and hierarchical group analysis procedures).

In very abbreviated form the results of the analyses for India and Thailand were as follows:

a) In neither nation is lower-primary school wastage explicable in the same terms as wastage at upper-primary school levels. The two phenomena are quite different as are the variables most potent in explaining the differences.

b) For India there is a strong relationship between the completeness of lower-primary school grade structure and wastage at upper levels of schooling. (It is hypothesized that the child who misses a lower grade or grades and enrols in upper primary is less able to compete and consequently drops out).

c) For Thailand there is an equally strong relationship between lower-primary school wastage and the availability and completeness of upper-primary schooling. (It is hypothesized that parents, perceiving the non-availability of complete primary level schooling, are more prone to withdraw their children than are parents who live in regions or areas where complete primary schools exist).

d) It is also clear that the quality of schooling which a child receives in the lower school is closely related to his or her retention at upper primary levels.

e) In almost all instances, school network or distribution variables are better predictors of wastage (i.e. better explain the differences which occur) than are quality-of-school variables. (Indeed in the Thai case, 81 per cent of the differential in wastage between grades IV and V can be explained in terms of a school network variable based upon the ratio of lower-to-upper school place provision).

Such findings have one major planning implication. Planners seeking to improve the efficiency of school systems in these nations are unlikely to succeed while ignoring the factor of distribution. It should be emphasized that the data base which uses enrolment statistics probably underestimates real wastage. There is a basic difference between enrolment and attendance, for which unfortunately we have little relevant data. Indeed in some known instances, attendance is so irregular as to constitute—in any practical sense—drop-out.

A feature of the research work undertaken has been an analysis of the regional disparities which occur within India and Thailand in terms of the provision and distribution of primary schooling, and the quality of that schooling. This will be the subject of further publication, but it is sufficient to note here that:

a) The disparities in provision between provinces, states and regions are massive, marked and long-standing.

b) Disparities in the provision of primary schooling, particularly in terms of physical access, correlate well with disparities in quality of schooling. Regions with comparatively poor access have, using most criteria, poor schools (poorly trained teachers, high pupil-teacher ratios, a high percentage of multiple-class teaching.

c) Not unsurprisingly these regional disparities in provision, distribution and access appear to correlate highly with historical development factors, the topography of the various regions and, most strongly, with socio-economic differentials. Two factors appear to be important here—the capacity of a region to fund educational services or to derive from central revenues the funds necessary for development, and the per-capita income level of the region.

Implications for educational planning

The striking significance of these findings appears to be that the regional disparities are so marked that they are likely to defy any solution based upon national-level planning. The major implication is for greater decentralization of planning and a differential set of inputs (a greater share of resources for areas with the largest backlog) if any attempt to equalize provision and equality of opportunity is to be made. Educational planners in the past have been little concerned with matters of primary school location and distribution. If goals of equity and efficiency are to be pursued with any vigour at all, planners must recognize the inter-relationships between the location and distribution of school facilities and pupil equity of access and opportunity for retention.

Second it is demonstrable that many present planners lack the capacity to handle these issues. They urgently require:

1. The skills necessary for the collection of relevant distributional data and its analysis and interpretation;
2. The theoretical and practical constructs that will enable them to assess, at regional and sub-regional levels, distributional requirements and needs of provision;
3. The theoretical and practical models that will enable them to decide upon alternative modes of school location and distribution which will increase equity and efficiency through the better construction of school and non-school networks of facilities.

Finally, it must be recognized that these deficiencies cannot be made good without a policy framework dedicated to the intents of the Karachi Plan. A different kind of decision-making is required. In some nations of the Asian region, the decisions to be taken may only involve pockets of poor provision—mal-location and mal-distribution—in order to increase the opportunities for groups currently at a disadvantage. In other nations, the

decisions to be taken involve extensions or expansions to existing primary school networks to take up unused capacity. For example in some places, a double or triple shift of existing lower primary schools for upper primary pupils might significantly increase retention rates.

In yet other instances, the backlog of school provision is so great and networks so immature that traditional forms of school system development will not in any way meet the demands and needs of the immediate future. In these instances, alternative strategies to schooling have to be investigated and evaluated.

In the last analysis very few of these decisions can be rationally taken without a greater understanding of locational and distributional matters. Progress towards the goals of Karachi appears generally slower than anticipated and, even at this pace, such progress is uneven. In many Asian nations, the expenditure on primary education has not kept pace with expenditure at other levels. In many nations the per-capita funds allocated for primary education have suffered in the face of other priorities. If the goals of the Karachi Plan are to remain viable, particularly for the less educationally advanced nations of the region, new distributional planning inputs are required, as are alternative strategies to schooling. All this will demand courage in the re-ordering of priorities.

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for Education in Asia
Number 17, June 1976

DESIGN FOR LEARNING OUT OF DOORS

The situation

As this is being written on a January morning, many children in Afghanistan, Iran, northern India, Pakistan and Nepal are undoubtedly sitting outside their school buildings learning in the warm sun. (Plate 1) In many places, only those studying science, industrial arts or home economics will be unfortunate enough to have to remain in cold laboratories and workshops. Certainly, in those parts of Afghanistan, India and Pakistan where snow is thick on the ground, the schools will either be closed or the children will have to remain in the school building; elsewhere they will be outside. (Plate 2)

School in the sun is by no means confined to the month of January. Temperatures in many areas begin to be such that it is uncomfortable to remain in an unheated building after September—they may remain low until April or May. So the period during which buildings remain largely unused extends over roughly half the year.

The north of India is the most southern part of the area under discussion and thus the warmest. A glance at data relating to Indian conditions will show why students and teachers prefer to work outside rather than

Plate 1

Plate 2

inside their school buildings during the winter. The conditions of comfort for four selected months at Dehradun, Delhi, Roorkee and Srinagar in northern India are as given in the table below. It will be seen that the measurements of the meteorologists, synthesized by physiologists, merely confirm a view on thermal comfort to which hundreds of thousands of children and teachers give annual expression by holding school sessions in the warm sun during the winter months.

Town	Comfort condition			
	January	May	August	November
Dehradun	1–2	2–6	4–6	1–1
Delhi	1–2	3–6	4–6	1–4
Roorkee	1–2	2–6	3–6	1–4
Srinagar	1–2	2–7	4–7	1–4

1 = Very cold 3 = Cool 5 = Warm 7 = Very hot
2 = Cold 4 = Comfortable 6 = Hot

This does not suggest, as some would have it, that shelter is not necessary for education. Even in the late autumn and early spring there are days when it can be uncomfortably hot and it is preferable to be inside the school building. Rain or snow may fall, and shelter is necessary. And in all of the countries, the summer sun and dust make the existence of some shelter imperative.

Yet, strangely, it is only for these short, hot summer months that proper physical facilities for education are provided in the form of schools. That these buildings are largely unused for six months of the year when the students are on the site seems to be almost totally disregarded by most educational facility designers. Odd logic, indeed, so carefully to provide a concrete floor to sit on, chalk and pin-up boards, pin-rails, cupboards and all the other paraphernalia of education *inside* the building when for much —even most—of the year, the educational activity is outside.

Education out of doors

That the activity continues at all is, of course, largely due to the inventiveness of teachers and children. Rickety chalkboards are carried outside and propped against walls or stood on shaky easels. (Plate 3) Mats are arranged on the ground, and furniture, usually not designed to be moved daily, is laboriously carried outside for teachers and students to sit on. (Plates 4 and 5) Visual aids are conspicuous by their absence and forgotten chalk and books have to be brought from the dim recesses of the building.

Plate 3

Plate 4

Plate 5

The situation is not, however, without humour or design interest. Teachers who insist on partitions between one class and the next inside the building seem happy to teach outside without the traditional dividing walls which, they claim, are needed to reduce sound to levels at which communication with the children becomes possible. (Plate 6) The teachers are usually right: interior walls are sounding boards which intensify noise levels, while sound disperses itself more readily out of doors (this does not in turn call for electronic magnification—'loud speakers'—electronic sound can form the very worst kind of noise pollution).

Plate 6

Children normally grouped in rigid rows inside the classroom are—when outside on the site—occasionally allowed to sit informally, perhaps in a circle round the teacher or in small groups, for group projects. (Plate 7) More interestingly, however, most teachers continue to group the children on the open site just as if the walls of the classroom were still around them. (Plate 8)

Plate 7

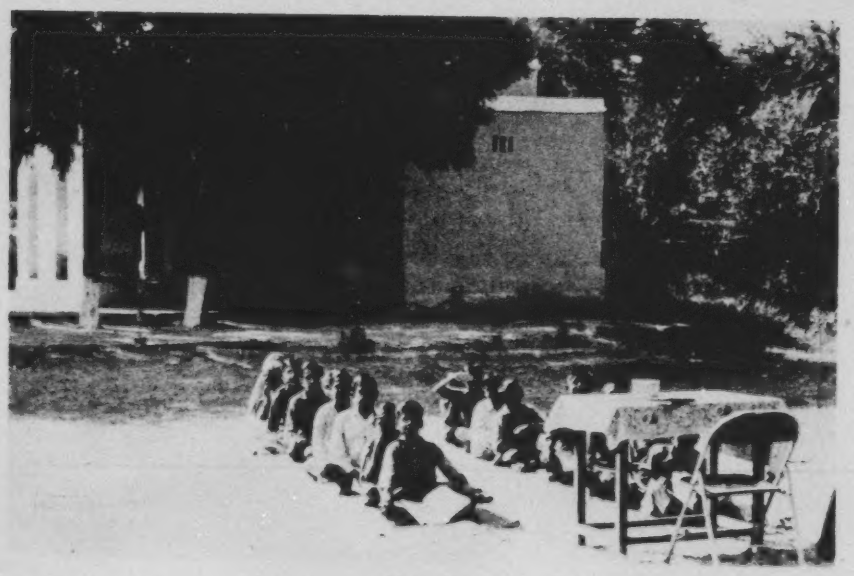


Plate 8

This observation on grouping is important as it suggests that the form of the classroom—that is the rectangular box—exercises a very strong influence on classroom practices adopted by teachers in respect of where they stand, how they group the children and ultimately, of course, on how they perceive their role as educators. The situation is one which has somewhat Pavlovian overtones and is worthy of further investigation. One thing seems certain: if it is desired to encourage the regrouping of children as part of an attempt to bring about some sort of educational change, schools using *sites* rather than *buildings* would be the place to experiment.

Another observation is pertinent. Teachers are now beginning to be trained especially for work in one- or two-teacher schools. Is there not an equally good case to be made for studying the role of a teacher with reference to a site rather than to a building and providing appropriate training for this compound situation? The experiences of the on-the-spot teacher-education programme in Nepal would be of interest in this context.

Planning for education inside or out?

That school out of doors is a reality in at least five countries of the region is not in doubt. The result seems to be a fairly common pattern of educational activity having its own distinct characteristics. The problem facing the educational planner, educators and school designers is how to improve the environment for children receiving their education in these circumstances.

The most evident solution is to provide heating inside the schools so that the buildings can be used throughout the year as was intended by those who designed them. In urban areas, this solution often has to be adopted as the school site is sometimes too small to accommodate the children outside. Also supplies of fuel needed for heating are more readily available in the towns than in the rural areas. So, in the towns, most classrooms will have stoves and outlets to chimneys in their ceilings and, when it can be afforded, fuel will be provided for heating.

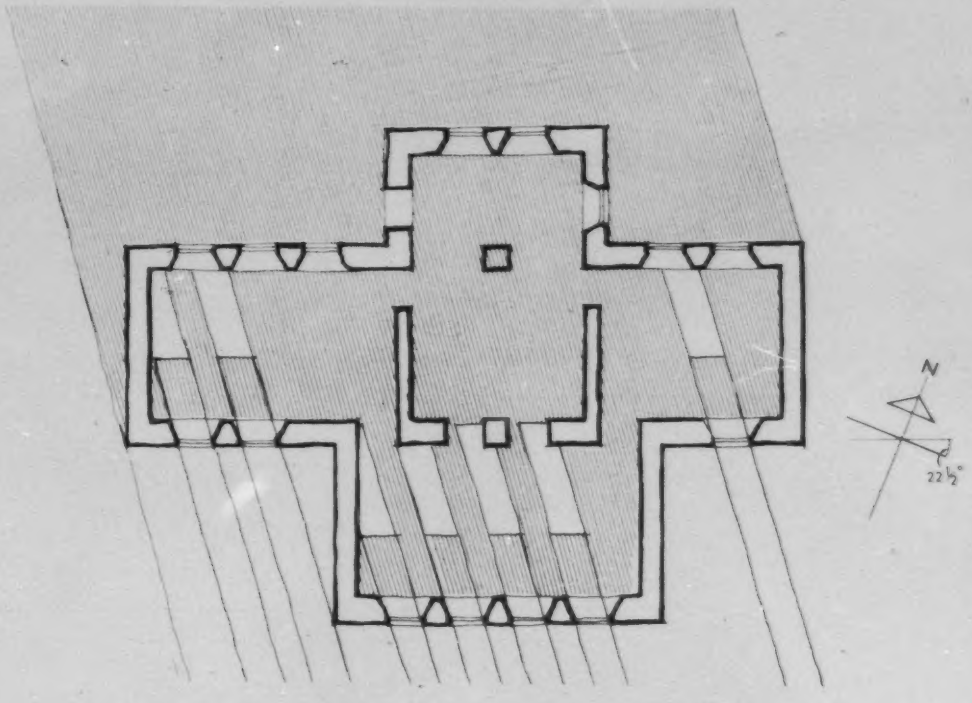
In the rural areas, however, where there is usually only just enough wood for limited heating of the houses of the well-to-do, the planner faces the choice of supplying fuel to the school or using the sun's heat, which is supplied *free*.

The cost of heating a modest, five-classroom rural primary school in Pakistan, for example, can fairly easily be calculated. With fuel at US $0.15 per litre and heating for the four coldest months of the year, the expenditure on heating one school would be of the order of US $200 or, for a 200-place school, one US dollar per student place per annum. If such heating were to be provided then it would increase the annual recurrent cost of primary education in Pakistan by some 6 per cent, adding nearly four million dollars to the bill.

If this is consequently rejected as being unreasonably expensive, then the next approach might be to consider how heat from the sun could be introduced into the building to warm it up without cost. In Afghanistan, primary schools are now being oriented on site in such a way that sun shines through the window into the classrooms in the winter and is excluded from the classrooms in the summer months. (Figure 1) The first schools constructed to capture solar heat in this way were built in 1975; it is early to evaluate the reactions of students and teachers to the warmer environment. One difficulty of the orientation approach to warming may be anticipated, however—that of precisely arranging the building on the site to face in the desired direction. The problem may arise either due to the configuration of the site or simply from lack of instruments needed to obtain the exact orientation.

It can thus be reasonably concluded that the surest method of making certain that students and teachers are warm enough to work is for them to use the direct solar heat obtained by working out of doors. What arrangements are needed to make this convenient?

FIGURE 1. DIAGRAM SHOWING LIGHT AREAS

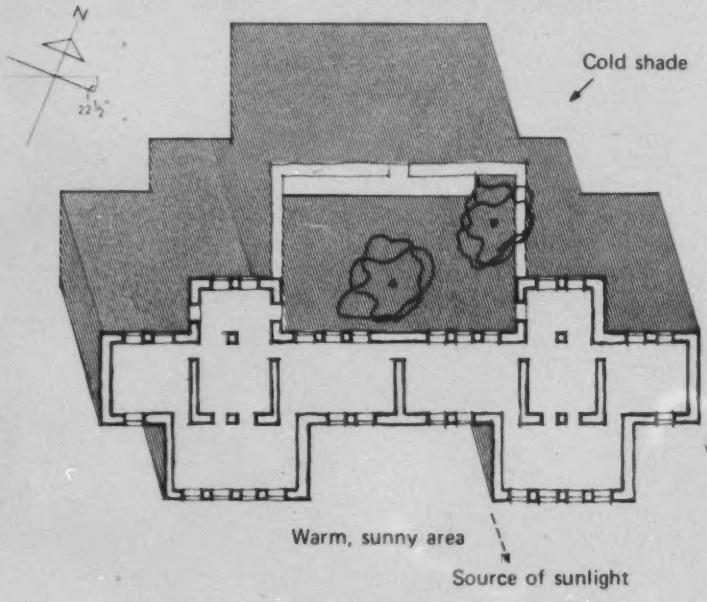


The light areas within the building are pools of sunlight from the windows at 9.30 a.m. on 22nd December.

Site design for education

The first consideration should be that of the location of the building on the site. The sun shines from a south-easterly direction in the morning, so it is the south-east of the site that needs to be free of shadow. Figure 2 illustrates the north-west throw of shadow from a small school and thus suggests the warmest area for the students to work.

FIGURE 2. SUN SHADING DIAGRAM



The south and south-east sides of the building are clearly the best places for learning out of doors.

In most of the countries to which this note has reference, the common practice is for primary school children to sit either on the ground or on low stools whether they are inside or outside the building. (Plate 9) Where children sit on the ground, either they themselves or the school authorities usually provide mats to help keep clothing clean and to provide some insulation from the cold damp floor (see Plate 4). This seems to work well in practice and presents no obstacles to the grouping of children either formally or informally. No case need be made, therefore, for the provision of paved areas for different class groups about the site.

Where the practice is for primary school children to use desk and benches or chairs, however, it is important to provide a hard, level surface for the furniture to stand on as it might otherwise be wobbly and unstable if stood directly on the earth. (Plate 10) One of the ways to do this is by means of an extended verandah on the south side of the building. (Plate 11)

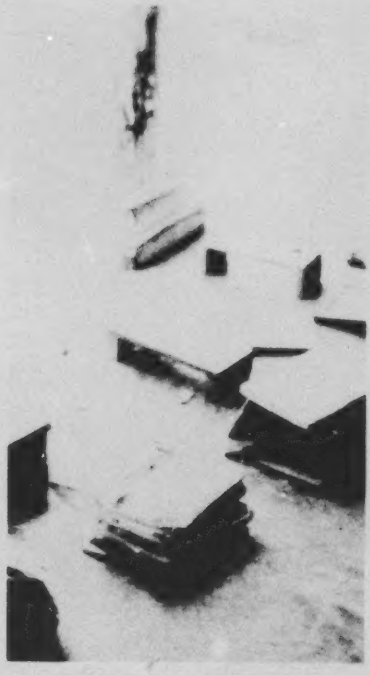


Plate 9

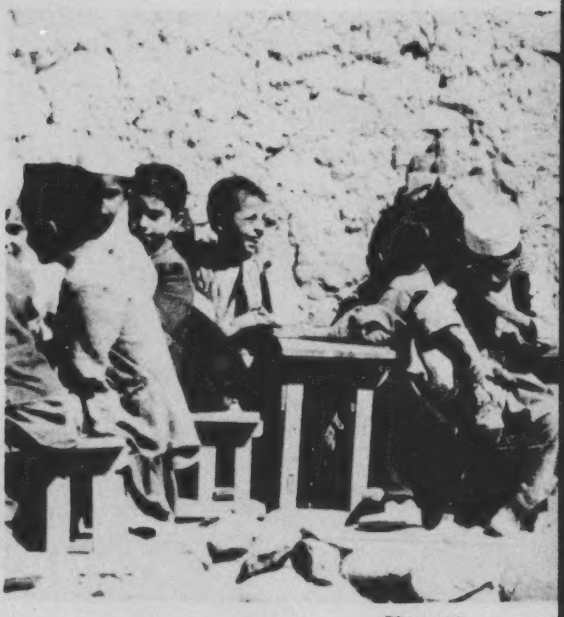


Plate 10

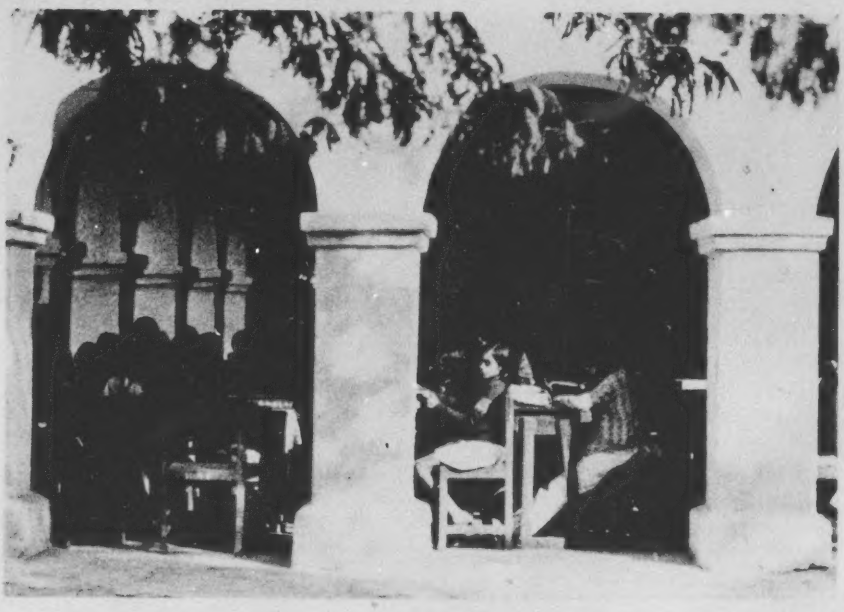


Plate 11

The remaining piece of equipment that, by consensus, seems to be required for teaching out of doors is the chalkboard.

One chalkboard should be provided for every grade in the school and, for a seven-grade school with only four external walls, this means the provision of a few chalkboards away from the building to which it will be possible to fix probably at most only two or three boards. Good examples of this are provided by Afghanistan's new schools which have chalk and pin-boards in their courtyards, (Plate 12) and by the new schools in the Indian State of Uttar Pradesh.

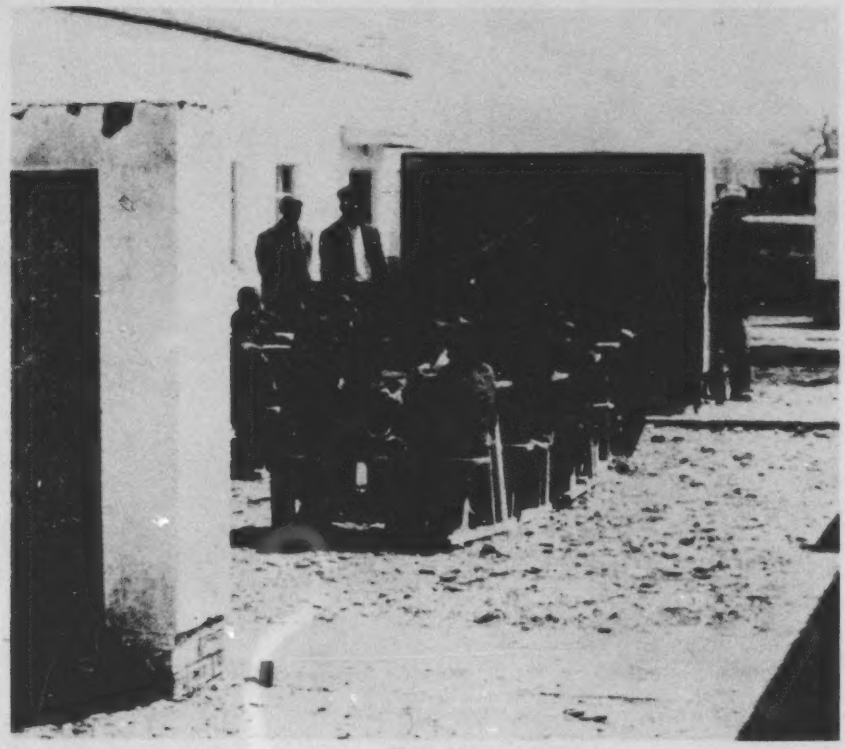


Plate 12

Two other matters require the designers' attention. First, there is the question of storage. A teacher needing a book with which to stress a point was once observed in a remote rural school in Uttar Pradesh. She had to leave her class, walk across the site, go through two rooms to reach her own and then delve deep into a chest to find what was needed. How much easier if every classroom opened directly from the sunny side of the building onto the site, with the storage cupboard just inside the door for easy access.

The second matter concerns the study of science, or arts and crafts. (Plate 13) Here, some small working surfaces outside the building may be helpful to give the children a firm base on which to model or make simple experiments. (Plate 14) For this, some water will be useful and so these working areas may be near the school stream or the tube well.

Plate 13

Plate 14

Were the temperatures in the countries with which this note is concerned less variable, it might be possible to suggest a more positive relationship between the outside and the inside of the school building. The Moghuls achieved this but at great expense, using high walls and fountains for cooling in the summer heat of over 40°C and moving, as at Fatepur Sikri, to the north of the walled courtyard in the winter to sit in the warmth of the low winter sun—romantic and functional but too expensive an idea to use for tens of thousands of modern primary schools.

In the present democratic age, the best we can hope for is an awareness on the part of the designer that children in Asia may spend as much time *outside* the school building as *in*, and the consequent reflection of this understanding in the simple physical provision for teaching and learning out of doors on the school site.

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Dr. J.A. JOHNSTON is currently Director of Research (Family Planning) at St. Vincents Hospital, Sydney, Australia. Prior to this, he held the posts of Senior Lecturer in Education, at Macquarie University, and Acting Dean of Faculty of Education, University of Malaya. He is also presently involved in Unesco's ISCOMPE project (International Study of the Conceptualization and Methodology of Population Education). He has lived and worked in most of the countries of the Asian region. Dr. Johnston is the author of some 80 books and scholarly papers, mainly on education.

SECTION FOUR

BIBLIOGRAPHICAL SUPPLEMENT

EDUCATIONAL BUILDING AND FACILITIES IN ASIA: A BIBLIOGRAPHY

The following bibliography of more than 100 entries provides abstracts of the bulk of the material relevant to educational building in the Asian region that has been published in recent years. It is a remarkably small collection, having regard to the very large numbers of schools that have been and are being built in the region, and the Regional Office would be glad to learn of any important regional material on the topic that has been omitted.

The abstracts have been prepared by the staff of the Educational Facilities Service of the Regional Office in a format that is in use in all of Unesco's Regional Offices and which arranges the material using descriptors in such a way that entries can be recovered mechanically from Unesco's Computerized Documentation Service in Paris, where they are stored. The descriptors which, in the bibliography that follows, are shown in italic type are derived from an Educational Facilities Theasurus which incorporates a number of descriptors from the International Bureau of Education (IBE) Thesaurus with which there is thus some compatibility.

Some of the abstracts now also form part of the data base of the International Educational Reporting Service (IERS) of IBE, Geneva.

As the abstracts given here are all in the same subject area, no attempt at further sub-division has been made and their presentation is in alphabetical order according to author.

Afghanistan. Central Authority for Housing and Town Planning. ***Building byelaws for Afghanistan.*** Kabul, 1972. 47 p.

Monograph series; drafts ***building regulations*** for ***Afghanistan;*** provides for ***interpreting*** and ***enforcing;*** divides ***building regulations*** into ***building requirements*** and requirements for ***utilization*** by function; section on ***building requirements*** deals with ***land use,*** levels of ***floors, dimensions*** of ***buildings, building structure, electrical installations, sanitation, heating, barriers*** to ***heat*** and ***sound, fire prevention*** and ***proofing*** against ***rats*** and ***termites;*** section on requirements for ***utilization*** by function deals with ***housing, offices, industrial building, public facilities,*** and other types of ***buildings*** including ***schools, libraries*** and ***child care centres.***

_____. Ministry of Health. Management Science of Health. ***Alternative approaches to solar heating of rural buildings in Afghanistan,*** by Stephen J. Fabricant. Kabul, 1975. 1 v. (various pagings)

Document, describes 11 methods of ***solar heating*** applicable to ***buildings*** in ***rural areas;*** discusses methods of low ***energy climate control;*** suggests traditional ***building form;*** embodies useful ***climate control components*** which could be modified to use ***solar radiation*** with low ***cost in use*** in ***Afghanistan.***

Asian Regional Institute for School Building Research, Colombo. ***Anthropometric data for students in Ceylon,*** by M. Kovac. Colombo /n.d./. 18 p. (Occasional Papers–School Building no. 15)

Monograph series on ***educational buildings;*** deals with ***anthropometric data*** for ***Sri Lanka;*** analyses ***sample survey*** of ***standing height*** measurements of 3,235 ***students;*** gives ***data*** in ***tables*** and ***diagrams*** of mean ***standing height*** separate for ***male*** and ***female students*** of ***age groups*** 5 to 19; gives application of ***data*** by ***diagrams*** to ***design*** of ***school buildings*** and ***furniture.***

_____. ***Anthropometric data for students in Iran,*** by D. Mooij. Colombo, 1972. 17 p. (Occasional Papers–School Building no. 16)

Monograph series on ***educational buildings;*** deals with ***anthropometric data*** for ***Iran;*** analyses ***sample survey*** of ***standing heights*** measurements of 1,256 ***males*** and 1,078 ***females*** in ***age groups*** 6 to 23 years, presents ***data*** in form of ***graphs*** and gives application through examples.

_____. ***Anthropometric data for students in the Territory of Papua and New Guinea,*** by Chee-Sun Chew. Colombo, 1971. 61 p. (Occasional Papers–School Building no. 14)

Monograph series on ***educational buildings;*** deals with ***anthropometric data*** for ***Papua*** and ***New Guinea;*** analyses ***sample survey*** of ***standing height*** and other ***dimensions*** of ***human body*** for 1,394 ***students*** in ***age groups*** 6 to 21 years; provides ***dimensions*** separate for ***males*** and ***females;*** provides ***computer programmes*** for ***anthropometric data*** analysis using Fortran-four ***language;*** presents analysis in form of ***computer*** print-out and ***diagrams.***

_____. ***Ceylon: design for daylight in schools.*** Colombo, 1971. 1 v. (various pagings). (School Building Digest no. 15). Also French edition: ***L'utilisation de la lumière du jour dans les écoles à Ceylan.***

Digest series deals with ***design*** for ***daylight*** in ***schools*** in ***Sri Lanka*** based on ***design sky*** of 700 foot-candles; describes ***methodology*** of assessing ***illumination levels*** at ***work places*** resulting from an arrangement of ***windows*** and, secondly, of calculating ***dimensions*** of ***windows*** to give desired ***illumination levels*** at ***work places*** by ***natural lighting*** of; illustrated by several examples, includes the ***grid*** and ***tables*** necessary for ***design*** of ***windows.***

_____. ***Chalkboards.*** Colombo, 1969. 6 p. (School Building Digest no. 8) Also French edition: ***Tableaux noirs.***

Digest series, deals with ***chalkboards*** as ***instructional aids*** in ***educational areas;*** describes with ***dimensions*** and ***diagrams*** the size and correct height for fixing ***chalkboards;*** discusses ***design*** of ***educational areas*** in relation to positions of ***chalkboards;*** lists desired attributes including ***flexibility,*** surface, ***colour,*** and ***materials.***

Asian Regional Institute for School Building Research, Colombo. ***Desk and chair dimensions for primary and secondary schools in the Asian region.*** Colombo, 1969. 4 p. (School Building Digest no. 6). Also French edition: ***Aperçus sur les dimensions de tables et de chaises conçues à l'usage des élèves asiatiques de l'enseignement primaire et secondaire.***

Digest series; gives key ***dimensions*** of ***desks*** and ***chairs*** for ***primary schools*** and ***secondary schools*** in ***Asia;*** relates ***dimensions*** of ***furniture*** to ***standing height*** of ***students;*** shows with ***diagrams*** the ***dimensions*** of ***classrooms*** to match ***furniture*** of different sizes; discusses distribution of ***furniture*** by size in relation to ***age groups*** of ***students*** in ***classes.***

_____. ***The design of biology laboratories for Asian second-level schools,*** by S.S. Sharma and D.J. Vickery. Colombo, 1969. 40 p. (ARISBR Study no. 2).

Monograph series; deals with ***design*** of ***biology laboratories*** for ***secondary schools*** in ***Asia;*** describes ***learning activities*** and ***teaching methods*** for ***biology;*** provides ***classification*** of ***biology experiments*** as guide to ***design*** of needed ***facilities*** in ***laboratories;*** discusses ***facilities design*** in relation to ***functional analysis*** of ***experiments;*** provides ***diagrams*** of ***furniture*** and layout of ***laboratories.***

_____. ***The design of chemistry laboratories for Asian secondary schools,*** by Jinapala Alles and D.J. Vickery. Colombo, 1969. 37 p. (ARISBR Study no. 3)

Monograph series; deals with ***design*** of ***chemistry laboratories*** for ***secondary schools*** in ***Asia;*** gives ***functional analysis*** of ***chemistry curriculum*** and ***teaching methods*** using ***Sri Lanka syllabus*** and ***equipment*** as an example; describes ***design*** of ***furniture*** and ***ancillary services*** for ***chemistry laboratory*** including ***construction*** and ***evaluation*** of ***prototypes*** in ***secondary schools*** in ***Sri Lanka*** and proposes ***design methodology*** for application to any situation in ***Asia.***

_____. ***The design of home economics laboratories for Asian second-level schools,*** by Eva B. Gonzalez and D.J. Vickery. Colombo, 1968. 103 p. (ARISBR Study no. 1)

Monograph series, deals with ***design*** of ***home economics laboratories*** for ***secondary schools*** in ***Asia;*** describes ***subjects*** included in ***home economics teaching*** in each country of ***Asia*** and compares parts ***syllabuses*** for ***Sri Lanka*** and ***India;*** outlines ***environment*** required in ***laboratories*** with reference to ***educational ergonomics;*** describes with ***diagrams*** the ***design*** and ***area per place*** needed for variety of ***laboratories*** including ***multi-purpose spaces;*** emphasizes ***design methodology*** and gives extensive ***bibliographies.***

Asian Regional Institute for School Building Research, Colombo. ***The design of industrial arts workshops for secondary general schools in the Asian region.*** Colombo, 1970. 8 p. (School Building Digest no. 13). Also French edition: ***La conception des ateliers destinés à l'enseignement des travaux industriels dans les écoles secondaires en Asie.***

Digest series; deals with the ***design*** of ***industrial arts workshops*** for ***general secondary schools*** in ***Asia;*** describes ***industrial arts,*** its ***curriculum*** and ***learning activities;*** illustrates by calculation ***methodology*** of establishing requirements for ***workshops;*** discusses ***design*** of ***multi-purpose spaces*** for ***workshops*** and suggests the ***area per place*** needed; discusses ***ergonomics*** and the ***design*** of ***workshops;*** gives ***diagrams*** showing principles of layout of ***workshops*** and ***data*** on furniture.

_____. ***The design of multi-purpose science laboratories for lower second level schools in Asia,*** by B.H. Söderberg. Colombo, 1970. 52 p. (ARISBR Study no. 11)

Monograph series; ***studies design*** of ***multi-purpose spaces*** for general ***science education*** and for integrated science in ***schools*** in ***Asia;*** describes factors influencing ***design*** of ***science laboratories*** including ***anthropometrics*** in relation to ***design*** of ***furniture*** and ***storage*** as well as ***circulation*** of ***students*** in ***laboratories;*** discusses ***teaching methods*** in ***science education*** and implications of ***class size*** and ***group activities*** for ***design;*** outlines ***user needs*** in respect of ***building services*** such as ***water supply, heating*** and ***electricity*** and discusses ***storage design;*** compares with ***diagrams*** to examples of ***design*** of ***laboratories*** for ***Malaysia*** and ***Sri Lanka.***

_____. ***The design of multi-science and integrated science laboratories for schools in the Asian region.*** Colombo, 1970. 6 p. (School Building Digest no. 9). Also French edition: ***Conception de laboratoires "polyvalents" et de laboratoires "intégrés" pour l'enseignement des sciences en Asie.***

Digest series; deals with ***design*** of ***science laboratories*** for general ***science education*** and for ***integrated science*** in ***schools*** in ***Asia;*** compares with ***diagrams*** two examples of ***design*** of ***laboratories*** for ***Sri Lanka*** and ***Malaysia*** and outlines the ***methodology*** of ***design*** with reference to ***educational methods*** and ***learning activities*** of the ***students;*** describes needs for ***building services*** and ***storage*** in ***laboratories.***

_____. ***The design of one-and two-teacher multi-grade schools.*** Colombo, 1970. 8 p. (School Building Digest no. 12). Also French edition: ***Conceptions d'écoles à un ou deux maîtres et à plusieurs années d'études.***

Digest series; deals with ***design*** of two and ***one-teacher schools*** for ***rural areas*** with low ***population density;*** discusses arrangement of ***students*** in ***small groups*** or for ***individual study;*** suggests other uses of ***buildings*** for ***adult education;*** lists ***equipment*** needed; describes ***furniture*** requirements; prescribes ***net areas*** per place in ***educational space*** and describes simple ***sanitary facilities.***

Asian Regional Institute for School Building Research, Colombo. ***The design of physics laboratories for Asian secondary schools,*** by C.C. Yu and D.J. Vickery. Colombo, 1968. 99 p. (ARISBR Study no. 4)

Monograph series; deals with ***design*** of ***physics laboratories*** for ***secondary schools*** in ***Asia;*** describes ***learning activities*** and ***teaching methods*** for ***physics*** and lists typical ***equipment*** used and ***storage*** required; outlines ***environment*** required in ***physics laboratories*** in terms of ***educational ergonomics;*** deals extensively with ***furniture*** for ***physics learning activities;*** explains with ***diagrams*** layout of ***space*** and ***area per place*** needed in ***laboratories*** and ***service areas;*** provides extensive ***bibliographies.***

_____. ***The design of workshops for second-level schools,*** by Khurshid A. Khan and D.J. Vickery. Colombo, 1970. 80 p. (ARISBR Study no. 5)

Monograph series; ***studies design*** of ***workshops*** for ***secondary schools;*** describes ***industrial arts*** as an ***educational area*** in ***lower secondary education*** and ***upper secondary education*** and gives ***content analysis*** of ***industrial arts courses;*** outlines ***design*** of ***space*** for ***industrial arts laboratories*** and ***equipment storage spaces;*** and explains terms synonymous with ***workshops;*** provides extensive information on ***ergonomics*** in relation to ***design.***

_____. ***Designs for desks and chairs of wood for schools in the Asian region.*** Colombo, 1971. 6 p. (School Building Digest no. 7). Also French edition: ***Construction de mobilier scolaire a l'usage des élèves de la région asiatique (chaises et tables en bois)***

Digest series; deals with ***design*** of ***desks*** and ***chairs*** of ***wood*** for ***primary schools*** and ***secondary schools*** in ***Asia;*** gives ***design guidelines*** and ***tables*** and ***diagrams*** with ***dimensions*** for six sizes of ***desks*** and ***chairs*** suitable for use by ***students*** of different ***age groups;*** explains ***construction*** of ***furniture*** with ***diagrams.***

_____. ***Determination of orientation and sunshading of Asian schools with the use of a heliodon.*** Colombo, 1969. 6 p. (School Building Digest no. 5). Also French edition: ***Orientation de bâtiments scolaires asiatiques et protection contre le soleil à l'aide d'un héliodone.***

Digest series; describes the heliodon, one of the ***tools*** for ***design*** of ***sunshading*** for ***schools;*** illustrates with ***diagrams*** use of heliodon to determine ***sun angles*** for different ***orientation*** of ***buildings*** at different ***geographic location*** throughout the ***school year.***

_____. ***Educational buildings space and cost norms for the educational planner,*** by D.J. Vickery. Colombo, 1971. 105 p. (ARISBR Study no. 16)

Monograph series; ***studies norms and standards,*** for ***space*** and ***costs*** from viewpoint of ***educational planner;*** stresses interaction resulting from ***decision-making*** in matters such as ***norms and standards, curriculum, syllabuses, teaching methods, educational organization, design*** and ***utilization*** of ***educational facilities, costs*** and the effects of ***political issues*** on ***educational planning;*** describes ***methodology*** for deriving ***norms***

and standards for ***space*** and ***costs*** for ***educational planning*** and effects of ***curriculum*** on ***schedules of accommodation;*** explains ***methodology*** of ***design*** for ***intensive use*** of ***educational facilities.***

Asian Regional Institute for School Building Research, Colombo. ***High-rise schools: a case study.*** Colombo, 1969. 25 p. (ARISBR Study no. 6)

Monograph series; ***case studies*** of ***multi-storied schools*** in ***Singapore;*** describes ***intensive use*** of ***sites*** to provide ***primary schools*** and ***secondary schools*** with ***facilities*** for large ***enrolment;*** gives with ***diagrams*** and ***tables data analysis*** of ***schedules of accommodation, educational programmes*** and ***administrative organization;*** describes ***architectural character*** of ***buildings*** as well as ***circulation*** and ***circulation areas.***

_____. ***High-rise schools: some administrative problems.*** Colombo, 1969. 26 p. (ARISBR Study no. 7)

Monograph series; ***studies administrative problems*** considered in ***decision-making*** on ***multi-storied schools*** in ***Singapore*** in the context of ***population distribution,*** available ***site area, urban planning, circulation, time-tables*** and ***flexibility.***

_____. ***Hong Kong: design for daylight in schools.*** Colombo, 1971. 10 p. (School Building Digest no. 17). Also French edition: ***L'utilisation de la lumière du jour dans les écoles à Hong-Kong.***

Digest series deals with ***design*** for ***daylight*** in ***schools*** in ***Hong Kong*** based on ***design sky*** of 500 foot-candles; describes ***methodology*** of assessing ***illumination levels*** at ***work places*** resulting from an arrangement of ***windows*** and, secondly, of calculating ***dimensions*** of ***windows*** to give desired ***illumination levels*** at ***work places*** by ***natural lighting;*** illustrated by several examples; includes the ***grid*** and ***tables*** necessary for ***design*** of ***windows.***

_____. ***The illumination climate and the design of openings for daylighting of school buildings in South East Asia and Ceylon,*** by V. Narasimhan. Colombo, 1970. 86 p. (ARISBR Study no. 13)

Monograph series on ***educational buildings;*** deals with the ***lighting climate*** and ***design*** of ***windows*** for ***daylight*** in ***school buildings*** in ***Hong Kong, Indonesia, Philippines, Singapore, Sri Lanka*** and ***Taiwan;*** describes ***programmes*** for measurement and analysis of sky luminance and ***daylight*** availability; outlines important factors in ***design*** of ***educational areas*** by ***daylight*** and gives ***tables*** for ***design*** of ***windows*** for desired ***illumination levels*** in ***educational areas;*** provides extensive analysis of ***data*** resulting from measurements in form of ***graphs*** and ***tables.***

_____. ***Indonesia—Java: design for daylight in schools.*** Colombo, 1971. 9 p. (School Building Digest no. 18). Also French edition: ***L'utilisation de la lumière du jour dans les écoles en Indonesie (Java).***

Digest series; deals with ***design*** for ***daylight*** in ***schools*** in ***Indonesia*** (Java) based on ***design sky*** of 700 foot-candles; describes ***methodology*** of assessing ***illumination levels*** at ***work places*** resulting from an arrangement of ***windows*** and, secondly, of calculating ***dimensions*** of ***windows*** to give desired ***illumination levels*** at ***work places*** by ***natural lighting;*** illustrated by several examples; includes the ***grid*** and ***tables*** necessary for ***design*** of ***windows.***

Asian Regional Institute for School Building Research, Colombo. ***Philippines—Manila: design for daylight in schools.*** Colombo, 1971. 10 p. (School Building Digest no. 19). Also French edition: ***L'utilisation de la lumière du jour dans les écoles aux Philippines (Manille).***

Digest series; deals with ***design*** for ***daylight*** in ***schools*** in ***Philippines*** (Manila) based on ***design sky*** of 600 foot candles; describes ***methodology*** of assessing ***illumination levels*** at ***work places*** resulting from an arrangement of ***windows*** and, secondly, of calculating ***dimensions*** of ***windows*** to give desired ***illumination levels*** at ***work places*** by ***natural lighting;*** illustrated by several examples; includes the ***grid*** and ***tables*** necessary for ***design*** of ***windows.***

_____. ***A primary school design workbook for hot dry Asia,*** by D.J. Vickery. Colombo, 1969. 107 p. (Technical Papers—School Building no. 1)

Monograph series; describes ***design methodology*** for ***primary schools*** in ***hot arid zones*** of ***Asia;*** includes material on ***educational programmes*** and describes ***cost control*** through establishment of ***cost limits*** in relation to ***cost per student area;*** provides ***technical data*** on ***building regulations;*** discusses ***site selection,*** desired ***environment*** and provides ***functional analysis*** of ***teaching spaces*** needed as well as of ***sanitary facilities, furniture*** and ***housing*** for ***teachers;*** considers ***adult education*** and ***community use*** of the school; includes ***bibliographies.***

_____. ***School building design—Asia.*** Colombo, 1972. 304 p.

Monograph series; provides ***data*** for ***design*** of ***primary schools*** and ***secondary schools*** in ***Asia;*** describes ***educational organization*** of countries of ***Asia, syllabuses*** and ***teaching methods;*** provides ***methodology*** for preparation of ***educational specifications*** and determining ***accommodation schedules; cost control, cost effectiveness,*** and planning ***costs*** all in relation to ***area per place*** discussed in chapter on ***costs*** of ***educational facilities;*** describes ***site selection, site analysis, site development;*** provides information on ***educational ergonomics*** including ***physical comfort, lighting, colour, thermal comfort, acoustics*** and ***circulation;*** provides ***data*** for the ***design*** of ***classrooms, special classrooms, laboratories, space*** for ***home economics,*** for ***industrial arts*** including ***workshops*** and information on ***design*** of ***multi-purpose spaces*** and ***libraries;*** discusses ***facilities*** needed for ***management*** of ***schools;*** provides ***data*** for ***design*** of ***building services*** including ***water supply*** and ***toilet facilities;*** discusses special problems arising from ***design*** of ***rural schools, multiple-shift schools*** and ***design*** for ***cyclones*** and ***earthquakes;*** provides extensive ***bibliographies*** to each chapter.

Asian Regional Institute for School Building Research, Colombo. ***Secondary school biology laboratory design: an approach.*** Colombo, 1969. 2 p. (School Building Digest no. 2). Also French edition: ***Plan de laboratoire de biologie pour l'enseignement dans les écoles secondaires; propositions.***

Digest series; deals with ***design*** of ***biology laboratories*** for ***secondary schools;*** describes changes in ***curriculum*** and new ***learning activities*** resulting in increased work by ***students*** in ***small groups*** on short- or long-term ***biology projects;*** this requires ***flexibility*** of ***furniture*** and ***building services; diagrams*** show ***laboratory table*** and ***laboratories*** arranged to ensure ***flexibility.***

_____. ***Secondary school chemistry laboratory design: an approach.*** Colombo, 1969. 2 p. (School Building Digest no. 2). Also French edition: ***Plan de laboratoire de chimie pour l'enseignement dans les écoles secondaires; propositions.***

Digest series; deals with ***design*** of the ***chemistry laboratory*** for ***secondary schools;*** describes changes in ***curriculum*** and ***teaching methods*** in ***chemistry*** resulting in more work by ***students*** in ***small groups;*** concludes there is need for ***flexibility*** in the ***chemistry laboratory*** and for special furniture to encourage work in ***small groups;*** describes field trials of these ideas in ***secondary schools*** in ***Sri Lanka;*** illustrates ***furniture*** and arrangement in ***chemistry laboratory*** in ***Sri Lanka.***

_____. ***Secondary school physics laboratory design: an approach.*** Colombo, 1969. 2 p. (School Building Digest no. 4). Also French edition: ***Planification de laboratoires de physique pour l'enseignement dans les écoles secondaires asiatiques.***

Digest series; deals with ***design*** of ***physics laboratories*** for ***secondary schools;*** describes new ***teaching*** and ***learning activities*** in ***physics*** requiring more ***flexible facilities*** and ***furniture*** and ***fittings*** that can be moved about in ***laboratories;*** illustrates movable ***physics tables*** for ***laboratories*** and includes ***diagrams*** of ***furniture arrangement;*** suggests suitable ***area per place*** for ***physics laboratories*** in ***secondary schools*** in ***Asia.***

_____. ***A simple multi-purpose furniture unit.*** Colombo, 1972. 8 p. (School Building Digest no. 10)

Digest series; deals with ***design*** and ***utilization*** of ***multi-purpose furniture*** unit for ***schools;*** describes unit with ***drawings*** giving ***dimensions;*** illustrates ***multi-purpose*** uses as ***desks*** for ***students*** of different ***age groups*** including use for ***adult education;*** illustrates use as ***tables, storage shelves,*** as ***stage*** for ***drama*** and as ***equipment*** for ***physical education.***

_____. ***Singapore: design for daylight in schools.*** Colombo, 1971. 10 p. (School Building Digest no. 20). Also French edition: ***L'utilisation de la lumière du jour dans les écoles à Singapour.***

Digest series; deals with ***design*** for ***daylight*** in ***schools*** in ***Singapore*** based on ***design sky*** of 900 foot-candles; describes ***methodology*** of assessing ***illumination levels*** at ***work places*** resulting from an arrangement of ***windows*** and, secondly, of calculating

dimensions of ***windows*** to give desired ***illumination levels*** at ***work places*** by ***natural lighting;*** illustrated by several examples; includes the ***grid*** and ***tables*** necessary for ***design*** of ***windows.***

Asian Regional Institute for School Building Research, Colombo. ***Some design aspects of high rise schools for the Asian region.*** Colombo, 1969. 28 p. (ARISBR Study no. 8)

Monograph series; ***studies design*** aspects of ***multi-storied schools*** for ***Asia;*** discusses concepts of ***buildings*** in relation to ***sites*** especially in respect of ***costs, cost per place*** for ***land*** and ***cost per place*** relative to ***storey height;*** considers ***circulation*** especially by ***lifts*** for which ***simulation model*** is given.

_____. ***A study of utilization, design and cost of secondary schools in Ceylon.*** Colombo, 1969. 88 p. (ARISBR Study no. 9)

Monograph series; ***studies*** the ***utilization, design*** and ***costs*** of ***general secondary schools*** in ***Sri Lanka;*** describes findings of ***surveys*** of ***educational buildings*** in ***Sri Lanka,*** the ***educational organization*** and ***resource allocations*** in respect of ***buildings;*** discusses ***administrative organization*** for ***design, contracting*** and ***construction*** of ***schools*** and use of standard ***building plans;*** analyses ***construction costs*** and ***cost per place;*** analyses ***designs*** from viewpoint of ***educational environment;*** suggests new ***designs*** providing ***educational space*** for ***classrooms, science laboratories, workshops,*** space for ***home economics, libraries*** and ***multi-purpose spaces;*** gives calculations for ***space requirement*** and for preparing ***schedules of accommodation.***

_____. ***A study of utilization, design and cost of secondary schools in the Khmer Republic.*** Colombo, 1971. 182 p. (ARISBR Study no. 14)

Monograph series; ***studies*** the ***utilization, design*** and ***costs*** of seven ***general secondary schools*** in the ***Khmer Republic;*** reviews ***methodology*** of determining ***schedules of accommodation*** to give ***intensive use*** of ***educational space;*** describes functional requirements of ***educational spaces*** for ***practical arts;*** outlines ***design*** criteria for ***educational spaces*** in respect of ***lighting, thermal comfort, furniture;*** lists criteria for ***site selection*** and ***site development;*** provides ***comparative analysis*** of ***space utilization*** in selected ***schools*** and ***comparative analysis*** of ***costs*** including ***elemental costs.***

_____. ***A study of utilization, design and cost of secondary schools in Singapore.*** Colombo, 1970. 122 p. (ARISBR Study no. 10)

Monograph series; ***studies*** the ***utilization, design*** and ***costs*** of ***general secondary schools*** in ***Singapore;*** describes ***educational organization, area per place*** and ***cost per place*** in ***schools;*** suggests ***space standards*** and ***intensive use*** of ***space;*** suggests ***methodology*** of calculating ***schedules of accommodation*** and deciding on ***space requirements*** with ***analysis*** of ***building plans*** of several ***general secondary schools.***

_____. ***A study of utilization, design and cost of secondary schools in West Malaysia,*** by R.H. Sheath and D.J. Vickery. Colombo, 1971. 80 p. (ARISBR Study no. 12)

Monograph series; examines ***utilization*** in relation to ***curriculum*** and ***design capacity;*** studies the ***quality*** of the ***educational facilities*** including ***classroom furniture*** and factors affecting ***environment*** such as ***lighting*** and ***sun shading;*** investigates the ***costs*** of new ***schools*** including ***capital costs, recurrent costs, costs*** of ***sites*** and ***site development,*** and calculates ***cost per place;*** describes procedures for ***administration*** of ***construction programmes*** and suggests ***methodology*** for calculation and control of ***schedules of accommodation;*** concludes with recommendations for ***research and development.***

Asian Regional Institute for School Building Research, Colombo. ***A study of utilization and design of new educational facilities in Iran,*** by A.R. Bagheri and M.R. Charifi. Colombo, 1972. 42 p.

Document; describes ***enrolment*** in ***schools*** in ***Iran;*** gives the ***educational structure;*** discusses ***curriculum*** and associated ***space utilization;*** gives ***design criteria*** for ***school buildings*** and discusses ***school size;*** provides ***data*** for calculating ***space requirements*** illustrated by references to ***secondary schools.***

_____. ***Television and school building design in the Asian region.*** Colombo, 1970. 6 p. (School Building Digest no. 14). Also French edition: ***Télévision et construction scolaire en Asie.***

Digest series; deals with ***design*** of ***school buildings*** in ***Asia*** to provide ***facilities*** for viewing ***educational television;*** illustrates with ***diagrams*** suitable ***viewing angles*** and distances of ***students*** from ***screen*** for various ***screen dimensions;*** shows with ***diagrams*** optimum ***classroom arrangement*** in relation to good ***viewing angles*** and to ***windows;*** gives ***educational television production facilities diagrams.***

_____. ***Typhoon: construction of typhoon resistant buildings.*** Colombo, 1972. 47 p.

Document; illustrates with ***drawings*** the ***construction*** of ***buildings*** to resist ***cyclones*** in ***tropical zones.***

Central Authority for Housing and Town Planning, Kabul. ***Roof for low-cost houses in Afghanistan,*** by L.R. Gupta. Kabul /n.d./ mimeo. 1 v. (various pagings).

Document; describes ***housing needs*** in ***Afghanistan,*** and ***organizations*** responsible for ***housing*** and for ***financing housing;*** discusses ***economic factors*** in relation to ***construction costs*** and provides ***specifications*** for ***housing*** having low ***costs.***

Central Building Research Institute, Roorkee, U.P. ***Acoustical designing and speech communication.*** Roorkee, U.P., 1969. 6 p. (Building Digest no. 64)

Serial; deals with design for good ***acoustics*** in ***auditoria;*** provides ***methodology*** for ***design*** in relation to ***dimensions,*** shape, ***sound reflection*** and ***sound absorption*** of ***walls;*** recommends values for ***sound reverberation*** for various ***spaces.***

Central Building Research Institute, Roorkee, U.P. ***Architectural control of sunlight penetration through windows.*** Roorkee, U.P., 1963. 4 p. (Building Digest no. 18)

Serial; deals with ***architectural design*** to ensure ***sun protection*** of ***windows*** of ***buildings*** in ***India;*** provides ***methodology*** for ***design*** of horizontal and vertical ***sun shading*** and for ***design*** of ***louvres;*** emphasizes importance of ***building orientation;*** gives ***case studies*** of application of ***methodology,*** with ***diagrams*** for a range of examples.

_____. ***Climatic design data and its application (hot and dry region).*** Roorkee, U.P., 1962. 3 p. (Building Digest no. 12)

Serial; deals with ***climatological data*** for ***hot arid zones*** of ***India*** and its application to ***building design;*** describes three ***design criteria,*** namely ***temperature, humidity*** and ***solar radiation,*** and gives ***graphs*** for summer ***design temperature*** and summer ***design humidity*** suitable for ***building design.***

_____. ***Climatological and solar data for India; to design buildings for thermal comfort,*** by T.N. Seshadri, ***et al.*** Meerut, U.P., 1969. 166 p.

Monograph series; deals with ***climatological data*** and ***sun angles*** in relation to ***design*** of ***buildings*** for ***thermal comfort*** in ***India;*** section on ***climate*** gives ***climatic zones*** and ***data*** on ***temperature, humidity, rain*** and ***wind*** with suggested values of ***thermal comfort*** in relation to ***geographic location*** in ***India;*** section on ***sun shading*** provides ***sun angles, data*** on ***sun shading*** and ***solar energy;*** includes ***sun shading*** protractors.

_____. ***Correction factors for thermal performance index; for different places, surface colour and orientation.*** Roorkee, U.P., 1973. 10 p. (Building Digest no. 103)

Serial; deals with ***solar radiation*** on ***walls*** and ***roofs*** and gives correction factors for ***colour orientation*** and ***geographical location*** gives ***methodology*** for calculating thermal performance rating.

_____. ***Cost reduction in primary school buildings; use efficiency method.*** Roorkee, U.P., 1972. 23 p.

Monograph series; provides ***methodology*** for ***cost control*** aimed at reduction of ***costs*** of ***school buildings*** through ***studies*** of ***time-tables*** of ***primary schools;*** suggests that use of ***outdoor teaching space*** can reduce requirements for ***classrooms;*** provides ***drawings*** of ***designs*** for ***school buildings*** with ***outdoor teaching space.***

_____. ***The design of windows for natural ventilation in tropics.*** Roorkee, U.P., 1967. 2 p. (Building Digest no. 49)

Serial; deals with ***design*** of ***windows*** for ***natural ventilation*** in ***tropical zones;*** gives ***methodology*** for determining ***dimensions*** of ***windows*** in relation to ***wind speed*** and ***dimensions*** of outlet opening.

_____. ***Determination of sunlight penetration indoors.*** Roorkee, U.P., 1972. 7 p. (Building Digest no. 102)

Serial; deals with penetration of sun in ***buildings*** in relation to ***sun angles;*** provides ***diagrams*** to establish ***dimensions*** of sun penetration from ***windows*** onto ***floors.***

Central Building Research Institute, Roorkee, U.P. ***Fenestrations for daylighting in the tropics; Part I—The sky component.*** Roorkee, U.P., 1966. 9 p. (Building Digest no. 40)

Serial; deals with ***design*** of ***windows*** for ***lighting*** by ***daylight*** in ***India;*** deals only with direct ***lighting*** and does not include ***light reflection;*** provides ***lighting*** definitions and describes ***daylight*** available in ***tropical zone;*** gives ***methodology*** for ***design*** of ***windows*** to achieve desired ***lighting*** levels in internal ***space;*** summarizes ***design data*** in tables.

_____. ***Fenestrations for daylighting of sidelit rooms; a simplified approach.*** Roorkee, U.P., 1970. 6 p. (Building Digest no. 82)

Serial; deals with ***design*** of ***windows*** for ***lighting*** by ***daylight*** in ***India*** with reference to sidelit rooms such as ***classrooms*** and ***laboratories;*** provides ***methodology*** for ***design*** including ***daylight factor*** calculation; includes ***diagrams*** giving ***daylight*** for different ***dimensions*** of ***windows.***

_____. ***Orientation of buildings.*** Roorkee, U.P., 1969. (Building Digest no. 74)

Serial; deals with ***orientation*** of ***buildings;*** discusses ***orientation*** in relation to ***sun shading,*** room location, shapes of ***buildings, air conditioning*** and ***solar radiation;*** provides ***methodology*** for calculating ***solar radiation*** load on ***walls*** of different ***orientation.***

_____. ***Planning primary schools,*** by R.D. Srivastava. Roorkee, U.P. 1964. 13 p.

Document; deals with ***design*** of ***classrooms*** for ***primary schools*** in ***India;*** concludes that ***classrooms*** for 40 ***students*** require ***area per place*** of 1.1 sq. m. for variety of ***learning activities;*** suggests ***educational areas*** such as ***classrooms*** should be nearly square; derives conclusions from ***survey analysis*** of shapes of ***classrooms*** and study of common ***learning activities.***

_____. ***Precast roof trusses for school buildings.*** Roorkee, U.P., 1971. 15 p.

Monograph series; deals with ***prefabrication*** in concrete of ***trusses*** for ***roofs*** for ***educational facilities*** in ***India;*** describes ***design, components, constructing*** and ***costs*** of ***materials*** and ***personnel;*** provides detailed ***drawings*** of ***trusses.***

_____. ***Prediction of air movement in buildings.*** Roorkee, U.P., 1972. 6 p. (Building Digest no. 100)

Serial; deals with ***air movement*** and its prediction in ***buildings;*** considers factors influencing ***air movement*** such as ***temperature, wind speed*** and location and ***dimensions*** of ***windows*** and ***doors;*** provides ***design methodology.***

_____. ***Single teacher school buildings.*** Roorkee, U.P., 1971. 22 p.

Monograph series; studies ***building design*** problems of ***one-teacher schools*** in ***India;*** examines distribution of ***one-teacher schools;*** provides ***areas analysis*** of existing ***schools;*** studies ***teaching*** and estimates ***space requirements;*** provides ***drawings*** of variety of ***design*** solutions with ***areas analysis*** of each —

Central Building Research Institute, Roorkee, U.P. ***Termite control measures in building construction.*** Roorkee, U.P., 1962. (Building Digest no. 14)

Serial; deals with ***construction*** for control of ***termites;*** discusses preparation of ***sites, construction*** of impermeable ***barriers*** and treatment of ***foundations, floors*** and ***building elements*** and components above ***ground level.***

_____. ***Thermal data of building fabrics and its application in building design.*** Roorkee, U.P., 1967. 6 p. (Building Digest no. 52)

Serial; deals with ***design*** of ***construction*** of ***buildings*** in relation to ***solar heating;*** describes ***materials*** and qualities of ***heat*** transfer; provides ***methodology*** for calculating thickness ***dimensions*** of ***materials*** in relation to ***heat*** insulation desired.

_____. ***Thermal performance rating and classification of flat roofs in hot dry climates.*** Roorkee, U.P., 1971. 6 p. (Building Digest no. 94)

Serial; deals with ***classification*** of flat ***roofs*** and their ***thermal insulation*** rating in the ***hot arid zones;*** provides ***methodology*** for rating ***thermal insulation*** characteristics in ***buildings*** including ***buildings*** having ***air conditioning;*** gives ***classification*** of ***roofs*** by ***materials.***

_____. ***University hostels: planning considerations.*** Roorkee, U.P., 1969. 22 p.

Monograph series; describes ***planning*** of ***student housing*** for ***universities*** in ***India*** but includes ***data*** suitable for ***design*** of ***student housing*** for ***higher education*** such as at ***teachers' colleges, technical institutes*** and the like; reports ***comparative analysis*** of ***space utilization*** in ***student housing*** of ***universities; studies space requirements*** for ***bedrooms; communal spaces, dining facilities*** and ***kitchens*** and ***sanitary facilities;*** analyses ***circulation areas;*** provides table of suggested ***norms*** and ***standards.***

_____. ***Window design for natural ventilation in tropics.*** Roorkee, U.P., 1968. 8 p. (Building Digest no. 62)

Serial; deals with ***design*** of ***windows*** for ***natural ventilation*** in ***tropical zone;*** discusses effect of ***dimensions*** of ***windows*** on ***ventilation*** at level of work ***tables*** as well as ***ventilation*** effect in relation to position along ***walls;*** provides ***data*** on probable ***ventilation*** patterns with ***windows*** in different positions in four ***walls*** of rooms; describes variations of ***ventilation*** in relation to ***dimensions*** and positions of ***windows*** for different ***orientation*** to ***wind;*** gives ***methodology*** for calculating ***dimensions*** of ***windows*** for ***thermal comfort.***

Chayasombat, Sittichai. ***Strategy for the development of school facilities in the Bangkok-Thonburi metropolitan area, 1968-1990.*** M.A. Thesis in Architecture, University of Texas, 1969. 88 p. Unpublished.

Document; deals with ***development*** of ***educational facilities*** for metropolitan area in Bangkok-Thonburi, ***Thailand;*** describes ***population trends*** and concludes that major ***construction programmes*** are needed to meet ***educational demand;*** provides ***guidelines*** for ***master plans*** in respect of creation of 30 new ***educational complexes*** designed to reduce disparities in ***education*** and to house the total ***school-age population;*** deals with ***geographical location*** of ***educational complexes*** and ***design*** considerations.

Detroit Public Schools. Office of School Housing. ***New tactics for building; experience, analysis, recommendations from the Detroit Public Schools Construction Systems Program,*** ed. by Wallace B. Cleland. Detroit, 1975. 162 p.

Monograph series; deals with ***administrative organization*** of ***building systems programmes*** in Detroit ***United States of America; reports*** comments of ***architects, engineers, contractors, construction management*** staff and owners on four ***pilot projects*** for ***schools;*** provides ***diagrams*** analysing organization of ***programmes,*** preparation of ***documents*** and ***construction scheduling; graphs*** and ***tables*** provide ***information sources*** for ***construction costs;*** directs ***research*** to concerns of ***architects, engineers, contractors*** and ***construction management*** personnel with ***design*** and ***organizations, documents*** and ***tendering,*** time and ***cost control*** and ***management*** of ***construction programmes.***

Economic Commission for Asia and Far East, Bangkok. ***Planning for urban and regional development in Asia and the Far East.*** Bangkok, 1971. 238 p.

Monograph series; deals with ***city planning*** and ***regional planning*** in ***Asia;*** includes ***data*** on ***demographic trends; studies physical planning*** of new ***urban areas;*** discusses ***administrative problems,*** and ***policies*** for ***development*** of ***city planning*** and ***regional planning;*** provides ***case studies*** of ***city planning*** in regional settings.

Great Britain. Ministry of Public Building and Works. Building Research Station. ***Roofs for warm climates,*** by R. Sperling. Garston, Watford, 1970. 135 p.

Monograph series; describes the ***design*** and ***construction*** of flat ***roofs*** for ***tropical zone buildings;*** discusses ***building requirements*** in relation to ***climate*** and ***thermal comfort;*** gives requirements for roofs in relation to ***structural design, climate control, building life span, fire protection, earthquakes, prefabrication*** and ***building maintenance;*** describes principles for ***construction*** in different ***materials*** and indicates ***guidelines*** for future ***research and development;*** includes ***bibliographies.***

Hong Kong. Royal Observatory. ***Tropical cyclone climatology for the China Seas and Western Pacific from 1884 to 1970; Vol. I: Basic data,*** by P.C. Chin. Hong Kong, 1972. 207 p.

Monograph; deals with ***cyclones*** in the ***tropical zone*** around the ***Philippines, China, Japan, Laos*** and ***Republic of Viet-Nam*** for period 1884 to 1970; ***diagrams*** show ***cyclone*** tracks by months; ***tables*** give ***wind speeds*** of each ***cyclone.***

India. Ministry of Education. ***Planning schools for India.*** New Delhi, 1959. 111 p.

Monograph series; provides ***design guidelines*** for ***design*** of ***schools*** in ***India;*** based in part on ***questionnaires*** addressed to ***local education authorities*** at State level; outlines facility requirements in detail concluding with note on needed ***research;*** contains extensive ***bibliographies.***

_____. _____. ***Schools for all.*** New Delhi, 1958. 23 p.

Monograph series; deals with provision of ***buildings*** for ***primary education*** in ***India;*** describes high ***capital costs*** of even simple ***classrooms*** and suggests ***resource allocations*** for ***classrooms*** for all ***students*** beyond the means of ***government;*** advocates the provision by ***government*** of very simple ***instructional materials centre*** or nucleus, on to which—through ***school community co-operation***—small classrooms of ***local materials*** can be built by the ***community.***

_____. Ministry of Education and Social Welfare. ***Report on the community school building.*** New Delhi, [n.d.] 28 p.

Monograph series; deals with ***design*** of ***community schools*** in ***India;*** provides ***educational specifications, norms and standards*** for every ***space*** as well as for ***furniture*** and ***equipment;*** emphasizes the need to use ***local materials*** in ***construction*** and provides ***building specifications*** for selected ***local materials;*** discusses ***educational environment, design*** of ***sites*** and ***buildings*** and gives ***design guidelines*** in relation to ***ergonomics;*** illustrates ***designs*** for ***community schools.***

_____. State Institute of Education, Chandigarh. ***Norms of equipment for primary and middle schools.*** Chandigarh, 1967. 44 p.

Monograph series; deals with ***norms and standards*** for ***equipment*** for ***primary schools*** and ***middle schools*** of Punjab State, ***India;*** includes ***data*** on ***buildings, furniture, instructional aids, science equipment, libraries*** and ***crafts.***

Institute for Research and Planning in Science and Education, Teheran. ***Handbook for the planning of educational facilities,*** by Carlo Testa and Susan Habibzadeh. Teheran, 1975. 128 p.

Document series; deals with ***educational facilities*** in context of ***educational planning*** at level of ***local education authorities*** and particularly with ***school location*** and optimum ***school size;*** describes ***decision-making*** in relation to preparation of ***educational maps*** having regard to ***educational economics, demography*** and ***social factors;*** illustrates ***methodology*** by reference to worked example; methods of ***data collection*** through ***sample survey*** outlined; provides information on ***norms and standards*** for ***schools*** and ***school sites.***

Institute for Research and Planning in Science and Education, Teheran. ***Sample survey of educational facilities in Iran,*** by Carlo Testa and Suzan Habibzadeh. Teheran, 1973. 44 p.

Monograph series; describes ***sample survey*** and provides ***survey analysis*** of ***educational facilities*** in ***Iran*** for ***primary schools*** and ***secondary schools;*** outlines the ***statistical data*** available on ***educational facilities*** and develops a ***methodology*** for ***surveys*** based on the state of ***building maintenance*** and predetermined ***standards*** classifying ***schools*** as requiring ***building improvement*** of various types or demolition; describes the ***methodology*** in detail and provides a rationale for ***sampling*** from national ***inventory*** and forms used in the ***sample survey;*** provides ***survey analysis*** of ***building improvement*** needs and unit ***maintenance costs*** as well as ***unit costs*** of ***furniture*** and ***equipment;*** extrapolates the ***costs*** for the total ***inventory*** for ***Iran.***

Japan. Ministry of Education. "Special issue: disposal of drainage at universities and colleges in Japan" ***Journal of educational facilities,*** no. 95, 1975. pp. 65-178. (In Japanese)

Deals with ***drainage systems, sewage disposal, liquid disposal*** for ***laboratories*** and ***buildings*** for ***medical education*** at ***universities*** in ***Japan.***

_____. _____. Administration Bureau. Educational Facilities Department. ***School buildings: national schools; 1973 annual report.*** (in Japanese) Tokyo, 1975. 87 p.

Series; deals with ***school construction*** of ***public schools*** in ***Japan*** in 1973; gives ***budget*** for ***construction;*** illustrates ***administrative organization;*** provides ***drawings*** of ***campus planning;*** gives ***building structures, built areas*** and ***costs.***

_____. _____. Educational Facilities Division. ***Facilities of food supply for schools.*** (In Japanese) Tokyo, 1962. 60 p. (Educational Facilities series no. 7)

Deals with food preparation facilities for ***schools*** in ***Japan;*** discusses the present ***design guidelines*** and offers recommendations for ***innovation;*** suggests ***planning*** and ***design methodology;*** gives ***dimensional data*** and ***equipment specifications;*** gives examples and ***drawings*** of ***designs.***

_____. _____. _____. ***Industrial, home economic and vocational education facilities for secondary schools in Japan.*** (in Japanese) Tokyo, 1963. 60 p.

Series; covers the ***methodology*** of ***planning*** and ***design*** of ***workshops*** for ***industrial education, home economics,*** and ***vocational education*** at ***middle schools*** in ***Japan;*** gives ***drawings, equipment*** and ***furniture.***

Japan. Ministry of Education. Administration Bureau. Educational Facilities Department. ***Outline of the new university of Tsukuba.*** Tokyo, 1973. 15 p.

Monograph series; with regard to one of the new ***universities*** in ***Japan,*** describes ***educational planning*** and ***educational organization*** for ***research*** as well as ***management;*** briefly describes the ***university campus*** and planned ***environment.***

_____. _____. _____. ***School building in Japan.*** Tokyo, 1967. 121 p.

Monograph series; in covering the subject, gives a summary of ***education*** in ***Japan,*** and the historical ***development*** of ***school building;*** describes the status of ***school buildings*** with ***statistical data*** including ***norms and standards*** and ***administration*** of ***school construction;*** pictures recent ***school buildings*** with ***drawings*** and ***photographs.***

_____. _____. Japanese Industrial Standard. ***Japanese Industrial Standard: school desks and chairs (classroom),*** Tokyo, 1966. 19 p.

Monograph series; deals with the ***standardization*** of ***desks*** and ***chairs*** for ***classrooms*** in ***primary schools*** and ***middle schools*** in ***Japan;*** provides ***drawings*** with ***dimensions*** for a range of ***furniture*** sizes and ***designs;*** gives ***specifications*** for ***materials*** to be used in the ***construction*** of ***furniture*** including ***timber*** and ***metals;*** prescribes performance specifications and gives ***nomogrammes*** for matching ***furniture*** to ***students*** using ***standing height*** criteria.

Johnston, J.A. ***The location and distribution of primary schools in Asia.*** (Vols. I & II) Ph. D. dissertation, Macquarie University, 1975. 641 p.

Monograph; analyzes ***school location*** and distribution historically to identify the ***planning*** process inherited; provides ***classification*** of ***school location*** patterns with ***case studies*** of ***school location*** in ***India*** and ***Thailand;*** suggests ***models*** of ***school location*** for ***Asia*** and discusses implications for ***educational planning.***

Koenigsberger, Otto and Robert Lynn. ***Roofs in the warm humid tropics.*** London, 1965. 56 p. (Architectural Association Paper no. 1)

Monograph series; in discussing the subject, offers ***performance specifications*** and provides ***climatological data*** for various localities in the ***tropical zone*** including Bombay in ***India,*** Colombo in ***Sri Lanka,*** Bangkok in ***Thailand,*** Kuala Lumpur in ***Malaysia*** and ***Singapore;*** describes the transmission of ***heat*** through ***roofs*** of different ***construction*** and ***materials;*** provides ***estimated costs*** of various types of ***roofs.***

Narasimhan, V. ***An introduction to building physics.*** Madras, Kabeer Printing Works, 1974. 256 p.

Monograph series; discusses ***building physics*** in the context of ***environment*** and ***comfort*** for ***India*** but substantially applicable to ***Asia;*** discusses ***acoustics, lighting, ventilation, comfort, climate*** and ***heat*** transfer in ***buildings.***

National Building Organization, New Delhi. ***Report on higher secondary school buildings.*** New Delhi, 1960. 27 p.

Monograph series; deals with ***upper secondary schools*** in ***india; reports*** the work of a panel to establish ***norms and standards;*** provides extensive ***survey analysis*** of 103 ***upper secondary schools*** including ***data*** on ***site areas, enrolment, area per place, dimensions*** of ***classrooms,*** numbers of ***teachers*** and scale of ***sanitary facilities;*** makes recommendations for ***norms and standards*** in respect of ***school size;*** numbers of ***students*** in ***classrooms, areas per place*** in ***classrooms*** and in ***laboratories,*** size of ***libraries*** and ***auditoria; schedules of accommodation*** for ***administrative spaces, storage*** facilities needed, ***communal spaces, dining facilities*** and ***sanitary facilities;*** recommends size of ***circulation areas,*** of ***sites*** and describes desired ***environment.***

Philippines. Department of Education. ***Special fund for education; school building construction project 1967-1968.*** Manila, 1966. 39 p.

Monograph series; describes a proposal for ***construction*** in the ***Philippines*** of ***school buildings*** of two types, one for areas of ***cyclones*** and the other in ***timber*** for non-cyclonic areas; gives ***dimensions*** and ***costs*** of both types and describes ***administrative organization*** for implementation; lists ***materials*** needed and ***geographic location*** on provincial basis for ***construction.***

School of Research and Training in Earthquake Engineering, Roorkee, U.P. ***Construction of small buildings in seismic areas,*** by A.S. Arya. Roorkee, 1968. 1 v. (various paging) Reprint from the ***Bulletin of the Indian Society of Earthquake Technology,*** nos. 3 and 4, 1968.

Series; describes ***design criteria*** for small ***buildings*** to resist ***earthquakes;*** recommends ***construction practices*** for ***buildings*** in ***masonry construction, timber*** and ***steel*** tubes; presents ***design*** for small ***housing*** for ***construction*** in ***seismic area.***

Singleton, John. ***Nichu: a Japanese school; case studies in education and culture.*** New York, Holt, Rinehart and Winston, 1967. 125 p.

Monograph series; reports on ***case studies*** of ***middle schools*** in ***urban areas*** of ***Japan*** with special reference to single schools, ***studies educational organization*** and ***educational programmes*** in relation to ***environment;*** describes organization of ***classrooms, school community co-operation, community role,*** role of ***teachers*** and provides detailed ***functional analysis*** of ***middle schools*** in their setting.

Soriano, Domingo. ***The school plant of the Philippines.*** Manila, Rex Book Store, 1968. 183 p.

Monograph series; deals with ***design, furniture, sites, evaluation*** and ***educational finance*** for ***educational facilities*** in the ***Philippines;*** provides ***methodology*** for ***design*** including ***anthropometric data;*** discusses ***development groups*** for ***design*** and suggests ***methodology*** for estimating ***school-age population.***

Thailand. Ministry of Interior. Bangkok-Thonburi City Planning Project/Litchfield Whiting Bowne Associates. ***Education, an inventory and analysis of existing educational facilities and recommended standards for school sites.*** Bangkok, 1960. 1 v. (various paging) (Technical Monograph: Education no. 8)

Monograph series; an ***inventory*** of ***educational facilities,*** it recommends ***norms and standards*** for ***school sites*** for Bangkok-Thonburi, ***urban areas*** of ***Thailand*** for purposes of ***physical planning;*** provides maps of urban areas giving ***geographical location*** of ***educational facilities;*** lists ***private schools*** and ***public schools*** in ***urban areas*** and gives extensive ***statistical data*** on ***construction,*** state of ***building maintenance*** and ***site areas*** of all ***educational facilities*** in the ***urban areas*** except ***universities.***

Unesco. Regional Office for Education in Asia, Bangkok. ***Anthropometric data—collection and use.*** Bangkok, 1973. 4 p. (Educational Building Digest no. 3)

Digest series describing collection and use of ***anthropometric data;*** explains constant ***ratio*** between parts of ***human body*** and ***standing height,*** making necessary only measurement of ***standing height*** in ***sample survey*** of ***male*** and ***female students;*** illustrates ***data collection*** and ***data processing*** forms to calculate mean ***standing height*** of ***students;*** describes ***methodology*** for calculating distribution of ***furniture*** of different sizes in relation to ***students*** of various ***standing height*** ranges.

_____. _____. ***Anthropometric data available for the Asian region.*** Bangkok, 1974. 4 p. (Educational Building Digest no. 4)

Digest series; gives ***anthropometric data*** in the form of mean ***standing heights*** with standard deviation for ***male*** and ***female students*** of ***school age*** in ***Afghanistan, Bangladesh, India, Indonesia, Iran, Khmer Republic, Maldives Republic, Papua New Guinea, Philippines, Sri Lanka, Thailand,*** together with mean ***data*** for ***Asia.***

_____. _____. ***Anthropometric data for students in primary and secondary schools (grade I-XII) in Indonesia.*** Bangkok, 1974. 14 p.

Document, provides ***anthropometric data*** for ***students*** in ***Indonesia*** based on ***sample survey*** of 7,088 ***students*** and 147 ***teachers*** in Java; analyses ***data*** in ***tables*** to give ***standing height*** for boy and girl ***students*** and gives five other critical ***dimensions*** related to ***standing height.***

Unesco. Regional Office for Education in Asia, Bangkok. ***Anthropometric data for students in primary and secondary schools (grades I-XII) in the Khmer Republic,*** by G.J.A. van't Loo. Bangkok, 1974. 12 p.

Paper giving ***anthropometric data*** on ***students*** from ***Khmer Republic;*** analyses ***sample survey*** of ***standing height*** measurements of 3,671 ***male*** and 3,603 ***female students*** in ***age groups*** of from 5 to 23 years; presents ***data*** in ***graphs*** and ***diagrams*** and gives application through examples.

_____. _____. ***The case for an Asian programme of rural building development,*** by D.J. Vickery. Bangkok, 1975. 5 p. mimeo.

Document; describes disparities between ***rural environment*** and ***urban environment*** as characterized by ***buildings;*** discusses advantages of ***urban areas*** in respect of availability of ***construction industry, building materials, building trades*** and ***management;*** critically examines attempts to improve ***rural environment*** using ***local resources;*** describes wealth of scattered ***technology*** available in ***Asia*** in ***research centres*** and other ***organizations;*** explains how ***models*** of collaborative sharing of ***educational innovations*** between ***developing countries*** of ***Asia*** could be used to share ***building innovations*** and suggests framework for ***administrative organization*** and ***financing*** to implement ***programmes.***

_____. _____. ***Climate and school building design in Java,*** by D.J. Vickery. Bangkok, 1963. 1 v. (various pagings) (Occasional Papers–School Building no. 1) Also French edition: ***Architecture scolaire et climat, l'exemple de Java.***

First of monograph series; deals with ***design*** of ***educational buildings*** in respect of ***climate*** on island of Java, ***Indonesia;*** reviews factors affecting ***thermal comfort*** including ***temperature, rain, humidity, prevailing wind*** and ***wind speed,*** gives ***sun angles*** needed to ***design sun shading;*** discusses compromise ***orientation*** of ***buildings*** to take advantage of ***prevailing wind*** and keep ***sun shading*** to minimum.

_____. _____. ***Comparative anthropometric data: A-for use in Indian schools,*** by D.J. Vickery. Bangkok, 1964. 1 v. (various paging) (Occasional Papers–School Building no. 3)

Monograph series; deals with ***anthropometric data*** for ***India;*** analyses ***sample survey*** of ***standing height*** measurements of 68,987 children, gives analysis of data for ***students*** in age groups 4 to 17 years separately for ***males*** and ***females;*** presents ***data*** in ***diagrams*** and gives application through examples.

_____. _____. ***Comparative anthropometric data: B-for use in Thai schools,*** by D.J. Vickery. Bangkok, 1964. 1 v. (various paging) (Occasional Papers–School Building no. 4)

Monograph series; deals with ***anthropometric data*** for ***Thailand;*** analyses ***sample survey*** of ***standing height*** measurements of 101,921 children; gives analysis of ***data*** in form of consolidated, mean ***standing height*** for ***male*** and ***female students*** of ***age groups*** 7 to 16 years; gives application of ***data*** through examples.

Unesco. Regional Office for Education in Asia, Bangkok. ***Comparative anthropometric data: C-for use in Indonesian schools,*** by D.J. Vickery. Bangkok, 1964. 1 v. (various paging) (Occasional Papers–School Building no. 5)

Monograph series; deals with ***anthropometric data*** for ***Indonesia;*** analyses ***sample survey*** of ***standing height*** and other ***dimensions*** of the ***human body*** for 1,784 ***students*** in ***age groups*** 6 to 16 years; provides ***dimensions*** separate for ***males*** and ***females;*** presents ***data*** on ***standing height*** in ***diagrams;*** illustrates use of ***data*** by examples.

_____. _____. ***Comparative anthropometric data: D-application of data,*** by D.J. Vickery. Bangkok, 1964. 1 v. (various paging) (Occasional Papers–School Building no. 6)

Monograph series; makes a comparison of ***anthropometric data*** for ***students*** from ***India, Indonesia, Philippines, Thailand*** and ***United States of America;*** gives mean ***standing height*** of ***students*** from ***Asia*** as well as mean ***dimensions*** of other parts of ***human body;*** illustrates these ***data*** with ***diagrams*** and shows examples of application of use of ***data*** for ***design*** of ***furniture*** such as ***desks, chairs,*** and other ***fittings*** in ***educational spaces.***

_____. _____. ***Comparative anthropometric data: E-for use in Philippines schools,*** by Teodoro V. Santos and others. Colombo, 1964. 1 v. (various paging) (Occasional Papers–School Building no. 8)

Monograph series; discusses ***anthropometric data*** of ***Philippines;*** analyses sample survey of ***standing height*** and other ***dimensions*** of the ***human body*** for 2,732 ***students*** in ***age groups*** 7 to 15 years; provides ***dimensions*** separate for ***males*** and ***females;*** presents ***data*** on ***standing height*** in ***diagrams;*** illustrates use of ***data*** by examples.

_____. _____. ***A comparative study of multi-purpose rooms in educational buildings,*** by D.J. Vickery. Colombo, 1971. 1 v. (various paging) (Occasional Papers–School Building no. 7)

Monograph series; deals with the waste of ***space*** in ***school buildings*** and shows how use of ***space*** can be measured by a ***use factor*** which is a ***ratio*** of ***space utilization*** in hours to the time actually used; describes with examples how ***intensive use*** of ***space*** can reduce requirements for ***educational space*** and increase ***intensive use*** of ***specialized educational spaces*** while reducing ***circulation areas.***

Unesco. Regional Office for Education in Asia, Bangkok. ***Design against fire in schools.*** Bangkok, 1975. 12 p. (Educational Building Digest no. 7)

Digest series; covers ***design*** for ***fire prevention*** in ***schools;*** discusses ***fire resistance*** of ***building elements;*** describes detailed ***planning*** of ***schools*** for ***fire prevention*** within ***buildings*** including sizes of ***space, space division, dimensions*** of ***circulation space*** and ***stairs;*** describes location of ***doors*** and ***windows*** and the position of ***schools*** on ***sites*** for ***fire protection*** from ***buildings*** on adjoining ***sites.***

_____. _____. ***Educational ergonomics.*** Bangkok, 1975. 9 p. (Educational Building Digest no. 5)

Digest series; gives ***anthropometric data*** for ***students*** of ***Afghanistan, Bangladesh, India, Indonesia, Iran, Khmer Republic, Maldives Republic, Papua New Guinea, Philippines, Sri Lanka*** and ***Thailand;*** describes applications of ***anthropometrics*** to ***furniture design;*** discusses ***design*** of ***lighting*** in relation to desired ***illumination levels;*** provides ***guidelines*** for ***design*** for ***thermal comfort*** and for control of ***noise;*** concludes with discussion of ***circulation;*** provides extensive ***bibliographies.***

_____. _____. ***Environmental control in school buildings through planting,*** by Rooskandar Winant. Bangkok, 1964. 1 v. (various paging) (Occasional Papers—School Building no. 9)

Monograph series; describes contribution of planned ***site development*** through planting ***shade trees*** to ***environment*** by ***sun shading,*** improved ***ventilation, sound reduction*** and ***glare*** reduction; describes advantages of ***school gardens*** for ***biology teaching;*** lists suitable ***shade trees*** for ***school gardens.***

_____. _____. ***Improving the acoustic environment in open-hall schools.*** Bangkok, 1973. 4 p. (Educational Building Digest no. 1) Also French edition: ***Amélioration de l'acoustique dans les écoles à salle ouverte.***

Digest series; deals with ***acoustics*** in ***educational buildings*** without internal ***partitions*** or divided by ***flexible partitions;*** describes advantages of ***flexible partitions*** designed to provide ***chalkboards, display surfaces, storage*** and space for ***classroom libraries;*** describes contribution of ***flexible partitions*** to ***sound reduction*** in ***educational areas;*** lists factors contributing to good hearing conditions including ***school sites, spatial relationships,*** maximum distance between ***students*** and ***teachers*** and ***dimensions*** of ***flexible partitions*** for aural ***comfort.***

_____. _____. ***Innovation in management of primary school construction—a case study,*** by R.D. Srivastava. Bangkok, 1974. 68 p. (Educational Building Report no. 3)

Monograph series; describes application of ***innovations*** in ***management*** to ***construction programmes*** for ***primary schools*** in the largest state in ***India;*** outlines the ***research and development*** undertaken at the Indian building ***research*** institute leading to the ***development*** of ***prototypes*** of ***primary schools*** of two ***classrooms*** using ***pre-***

fabrication techniques for ***windows, doors*** and ***roofs;*** describes the ***management*** and ***administrative organization*** designed for ***planning*** and ***implementation*** including ***site selection*** and ***site acquisition*** and ***manufacturing*** of ***building components;*** includes details of award of ***management*** of ***contracts.***

Unesco. Regional Office for Education in Asia, Bangkok. ***A method of reducing classroom requirements in primary school in Asia,*** by R.D. Srivastava and others. Bangkok, 1967. 41 p. (Occasional Papers—School Building no. 13)

Monograph series; describes an experiment in northern ***India*** designed to test the possibility of reducing the ***built area*** of ***buildings*** for 40 ***primary schools*** by adjusting ***time-tables*** so that ***school sites*** can be used for selected ***learning activities*** in ***curriculum*** such as ***physical education, crafts*** and ***social studies;*** concludes that ***primary schools*** with five ***grades*** require three ***classrooms;*** reviews effects of ***climatic conditions*** on ***outdoor activities*** in ***India;*** suggests that ***thermal comfort*** of ***students*** engaged in ***outdoor activities*** should be checked.

_____. _____. ***Primary and village school buildings and teachers' houses; a report to H.E. the Minister of Education of the Republic of Afghanistan.*** Bangkok, 1973. 146 p.

Document; is concerned with the ***design*** and ***construction*** of ***primary schools*** and ***staff housing*** for ***teachers*** in ***Afghanistan; surveys*** the ***enrolment trends,*** examines ***curriculum,*** makes ***seismic analysis*** and studies ***local materials*** and ***construction*** in order to draw conclusions for ***design;*** discusses ***costs*** and ***management*** of ***construction programmes.***

_____. _____. ***A primary school design work for humid Asia,*** by D.J. Vickery. Bangkok, 1966. 66 p. (Occasional Papers—School Building no. 12)

Monograph series; covers the ***design*** of ***primary schools*** for the ***hot humid zones*** of ***Asia;*** describes characteristics of ***programmes*** for ***primary education;*** explains ***cost control*** in relation to ***area per place;*** provides ***technical data*** on ***building regulations, site selection,*** desired ***environment, design*** of ***educational space, sanitary facilities, furniture*** and ***housing*** for ***teachers;*** provides extensive bibliography.

_____. _____. ***School libraries.*** Bangkok, 1975. 8 p. (Educational Building Digest no. 6)

Digest series; deals with ***libraries*** for ***schools*** in ***Asia;*** discusses effects of ***resource allocations*** on size of ***libraries;*** suggests ***design*** approaches to ***libraries*** in ***primary schools*** including use of ***circulation spaces*** and unused ***storage facilities*** for books and reading; suggests use of ***furniture*** for ***shelves*** and gives ***dimensions*** of ***shelves*** and other ***furniture*** for ***primary schools*** and ***secondary schools;*** includes ***drawings*** of ***libraries*** and ***bibliographies.***

_____. _____. ***The shading of school buildings in Asia; sun shading diagrams,*** by D.J. Vickery. Bangkok, 1963. 30 p. (Occasional Papers—School Building no. 2)

Series; describes ***sun shading*** as an aspect of ***climate control;*** suggests ***orientation*** of ***buildings*** for maximum ***thermal comfort*** and provides ***sun angles*** for various countries of ***Asia.***

Unesco. Regional Office for Education in Asia, Bangkok. ***Small buildings in earthquake areas.*** Bangkok, 1973. 10 p. (Educational Building Digest no. 2)

Digest series; discusses the ***construction*** of small ***buildings*** of not more than two ***storeys*** and not more than 120 square metres in ***built area*** in countries subject to ***earthquakes;*** provides classification of ***seismic conditions;*** describes the mechanism of ***earthquakes;*** gives general ***construction*** and ***design guidelines;*** explains ***construction*** to resist ***earthquakes*** in ***foundations, walls*** of ***bricks, blocks, stone*** and ***earth, timber structural frame construction, concrete,*** heavy ***roofs*** and ***chimneys*** and ***flues.***

_____. _____. ***Sound diffraction around movable partitions in teaching spaces,*** by N.K.D. Choudhury. Bangkok, 1973. 61 p. (Educational Building Report no. 1)

Monograph series; deals with the ***diffraction*** of ***sound*** round ***flexible partitions*** used ***in educational areas;*** includes results of ***studies*** of ***acoustics*** in ***classrooms*** of ***schools*** in ***India, Malaysia, Singapore*** and ***Sri Lanka;*** shows that important factors for good hearing conditions are minimum heights of ***partitions, materials*** used in ***partitions,*** positions of ***chalkboards;*** based on measurement of ***articulation*** index through subjective tests, ***studies*** show first that no ***students*** should be more than seven metres from ***teachers;*** second that ***flexible partitions*** should have a ***sound reduction*** of at least four decibels; third that heights of ***partitions*** when ***teachers*** are back-to-back should be two metres and when at the opposite ends of adjoining ***classrooms*** two point four metres; fourth that ***sound levels*** in the ***classroom*** should not exceed 60 decibels.

_____. _____. ***Sun shading diagrams for school buildings,*** by D. Mooij. Bangkok, 1974. 30 p. (Educational Building Report no. 2)

Monograph series; deals with ***sun shading*** for ***educational buildings;*** provides ***data*** on ***sun angles*** for use in countries of ***Asia*** from latitude 10°S to 32°N; ***data*** are arranged in form of ***diagrams*** giving the ***sun angles*** for five choices of different ***orientation*** of the building for each two degrees of latitude; explains the use of the ***diagrams*** to obtain ***sun protection*** by overhanging ***roofs, louvres*** and other devices; advocates other ways of reducing ***heat*** as by ***orientation*** in ***hot humid zones*** to face the ***prevailing wind,*** thus achieving ***cooling*** by ***ventilation.***

_____. _____. ***Urban-rural disparities in education in Iran,*** by Karel Jansen. Bangkok, 1973. 20 p.

Document; ***studies*** through ***statistical analysis*** the disparities between ***rural education*** and ***urban education*** in ***Iran;*** shows the disparities related to ***education levels*** in respect of number of ***schools, administration*** procedures and ***curriculum*** relevance; describes ***Iran*** Government ***administrative reforms*** to correct disparities.

ABOUT THE BULLETIN

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